SCIENTIFIC AMERICAN

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THE SHIPMAN STEAM ENGINE.

American industry, every year, develops increased uses for time and labor saving machinery. Heavy and costly machinery, that was once used only by corporations and operated by powerful engines, is now modified to suit local and individual uses.

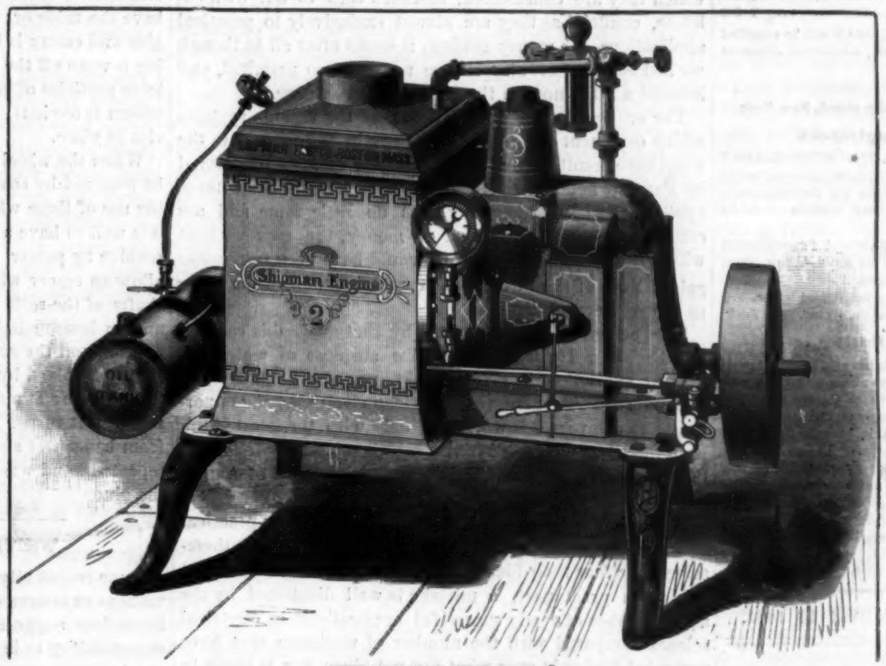
Farmers and mechanics and small manufacturers, in however remote localities, in this respect have now almost equal privileges with the centers of trade and industry.

The one barrier in the way of the general introduction of this machinery has been the want of a small power to operate it, a power that would cost but little to purchase, less for fuel to run it, and should be so automatic that it would take care of itself.

Engineers have been trying for years to discover such a motor.

We give herewith a description with illustrations of the new Shipman self-oiling steam engine. The manufacturers claim for this engine the following advantages:

1st. It requires no engineer. 2d. It is absolutely safe from fire or explosion. 3d. It can be started in the morning, and with the proper supply of oil and water it takes care of itself. 4th. It consumes only the amount of fuel necessary to supply the power taken. 5th. When power is not used, it puts out its own fire, and lights it again when necessary.



NEW SHIPMAN ENGINE NO. 2.

The boiler of the engine is constructed with a hollow cast iron back, into which the tubes are screwed. This method makes it very compact, and gives great heating surface. The boiler is built for safety, there being at no one point a surface over one-quarter inch unsupported. The boiler is incased in double jacket of sheet iron with an air space of one-half inch between them.

This construction prevents condensation, and also lessens the radiation of heat into the room. The firebox is of a new and peculiar form. It occupies but small amount of boiler space, and is so arranged that the water surrounds it on all sides. No appreciable heat

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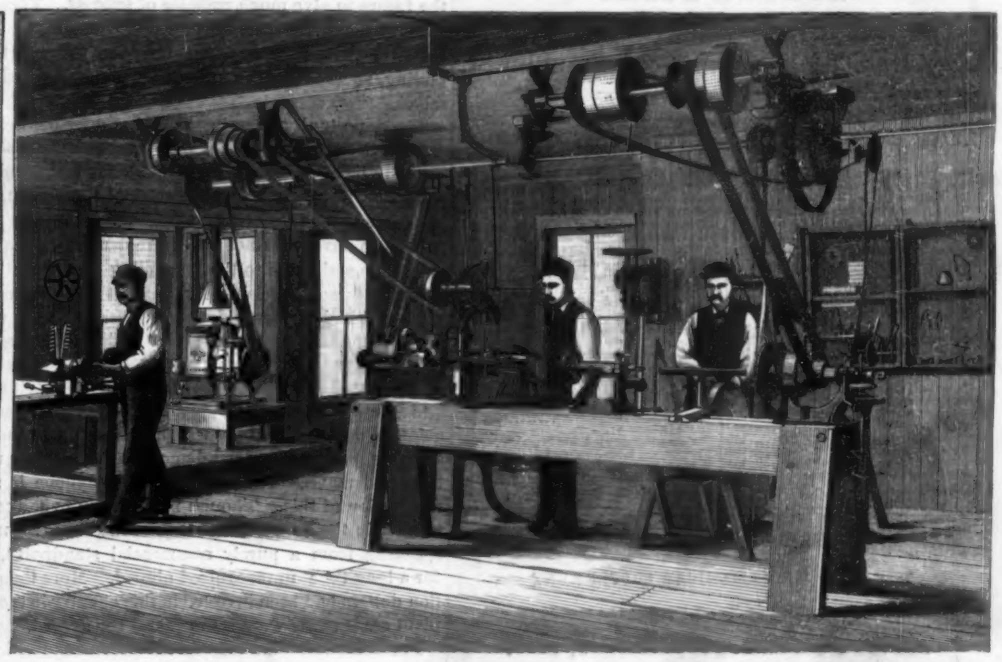
TESTING BOILERS TO 300 LB.



ENGINE NO. 2 AS EMPLOYED IN EXPERIMENTAL WORKSHOP AT BROCKPORT, N. Y.

ENGINE NO. 2 AS EMPLOYED IN RUNNING PRESSES IN PRINTING OFFICE.

ENGINE NO. 2 FOR ELECTRIC LIGHTING, ETC.

THE SHIPMAN ENGINE.

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REMOVAL.

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(Illustrated articles are marked with an asterisk.)

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THE SCIENTIFIC AMERICAN SUPPLEMENT

No. 454,

For the Week ending September 13, 1884.

Price 10 cents. For sale by all newsdealers.

THE INTERNATIONAL ELECTRICAL EXPOSITION.

Elsewhere in this number will be found a description of the International Electrical Exposition, which opened last week in Philadelphia. As will be seen from this, the projectors of the enterprise have succeeded in collecting under one roof, with few exceptions, all the important electrical apparatus of the day.

Probably at no other exhibition held in this country was foreign workmanship so readily distinguished from domestic. We are a practical people, and we are not always disinclined to boast of this practicality, but as we look over the European exhibits in this exposition, observe the nicety of the philosophical apparatus and instruments of precision, consider the carefully worked out theories and laws upon which they are constructed, and then turn to our own exhibits, confined as they are almost exclusively to practical applications, for money getting, it seems after all as though we had been better off were we not quite so practical, and loitered a little more in the paths of pure science.

The arc and incandescence lights of the various systems which ornament the pillars and hang in festoons from the walls have resulted from the application of laws discovered by Faraday and Oersted; and while the inventors of these applications have deservedly won no little fame and are credited with making a deal of money, the men without whose efforts such applications would have been impossible gained little of the former and scarcely enough of the latter to insure them a livelihood.

The principal objects sought by that admirable society, the Franklin Institute, under the auspices of which the present exhibition is given, might, perhaps, be fairly laid down as: 1st. To give the American electrician the opportunity to compare his work not only with the latest European models, but also with the handiwork of his fellow on this side the water. 2d. To exhibit the excellence of American electrical applications.

In regard to the first, it is well known that many practical and ingenious workmen are in the habit of keeping to themselves, for fear their ideas should be taken from them. That this is, in great part, a mistake is well illustrated by the small number of really successful applications in electrical science compared with the number of workmen that have struggled tirelessly over what has not given nor is likely in the future to give much promise of success. These men, or some of them, are searching for that which is not or for that which the interposition of a natural law prevents them from finding, at least in the manner they have proposed to themselves.

The opportunity of seeing what has gone before, what has already been done, and for mutual comparison of work, is likely to be of inestimable advantage, and the collection at one point, as at the present Electrical Exposition, of working models of the best construction up to date must, for reasons so obvious as not to require demonstration, be of incalculable assistance to the struggling and ambitious electrician and mechanician. As to what may be regarded as another principal reason for the exposition, viz., the exposure of domestic wares to a foreign audience interested in enterprises for which they are designed, much might also be said. Novelties require more than a casual introduction into a new market. A supply will not always insure an immediate demand. There was no demand for India-rubber galoshes, but the practical demonstration of their usefulness begat a demand. The case of the telephone is a striking illustration of this. Though now known to be a commercial success in the broadest meaning of the term, its usefulness, speaking from a purely commercial standpoint, remained for a long time unrecognized abroad. More than fifty million dollars had been invested in this country in the telephone plant ere it really went into general use abroad.

For these and other reasons the present exposition is likely to further the interests of American electricians, mechanics, and manufacturers, and they have reason to congratulate themselves that it was planned and is now being managed by so estimable a society as the Franklin Institute.

EMERY WHEELS.

The solid emery wheels have made possible a wonderful advance in the surfacing and polishing of metals in the shop, in truing centers, sharpening tools, and in other processes. Yet in some cases they are not equal to the homemade wheel for one reason—they become smaller by using, like the grindstone; and there are jobs where it is very desirable that the emery wheel should retain its original and uniform size. It is well, therefore, to give a few words of this almost forgotten shop lore.

The emery wheel should be of soft wood—pine is to be preferred—made of alternate layers of boards planed to make good joints, put together with glue and screws, the grain crossing each alternate layer of boards, which should be not more than three-quarters of an inch thick; half inch boards are better. Make the wheel slightly thicker than it is to be when finished, as it is to be turned and trued on the sides as well as the face. With a band saw or gig saw shape the glued-up and screwed boards to a circle, chuck it in a lathe, and bore and turn a hole and recess at the center to receive a disk, or gland, of iron that has been bored and faced up, having screw holes in its flange. The hub of the gland should be seated in the wooden wheel. When the gland is in place and secured, the wheel is ready to be turned to finish. It is mounted on an arbor for this purpose. Some wheels are to run on a threaded arbor, and the gland is therefore threaded.

After turning to size, peg a belt or band of wet belt leather with shoe pegs to cover the rim of the wheel, flesh side of the belt outside. This makes a hard wheel. If one with a yielding surface is desired, peg on layers of Canton (cotton) flannel to the requisite thickness, carrying them over the edges of the face to make a round edge. Cover the whole, not with leather, but with strong denim or bed ticking, pegging or tacking it on the sides of the wheel. This makes a soft or stuffed wheel, which is for polishing—not grinding—and it will do work of a somewhat irregular form.

Brush the face of the wheel with hot glue, pass a round bar through the center, and roll the wheel in emery that is spread in a shallow trough or on a clean table. Any particles of iron or steel filings in your emery will make trouble; have the table or trough perfectly clean. One coating of glue and emery is better than more, for when the outer coating is worn off the glue will glaze. Do not rap off any of the loose particles of emery until the wheel is perfectly dry; the reason is obvious: the undried glue will not hold the particles in place.

When the wheel has been worn, the glue and emery is to be removed by soaking in water, and the facing repeated. If the use of these wheels is sufficient to warrant the trouble, it is well to have a trough of water in which two iron rolls revolve by power, the faces of the rolls far enough apart to allow an emery wheel to ride and roll between them, the shafts of the rolls to be connected at one end by gear wheels and an intermediate, so that they both turn in the same direction, and the emery wheel standing on its face will be slowly revolved by their combined action, the water in the trough being at a sufficient height to just wet the face of the wheel as it turns. This method prevents the whole wheel from being wet and warped. If this method is not feasible, repeated hand washings of the face must be made to soften the glue.

WHITE PINE ORNAMENTATION.

Some recent attempts with white pine appears to give it a value as an ornamental wood which its common uses have not heretofore suggested. The softness of its texture and its susceptibility to injury may have had some influence in preventing its general use for ornamental purposes, but the wood can be "filled," so that much of this objection is removed. Its pure white color—white as compared with other woods—recommends it for purposes for which holly has been heretofore used; and the size of the timber from which clear lumber may be cut is greatly in its favor, boards of a width of sixteen and even twenty inches being not uncommon, with no shade of distinction between sap wood and heart, and only the faintest perceptible grain.

Some specimens lately examined show a greatly enhanced beauty by very simple treatment—the filling with warm shellac varnish, bleached shellac in alcohol, applied with a brush while warm. Several coats are given, the last coat being rubbed with pumice and rotten stone moistened with water, not oil. A finish of a flowing coat of copal varnish completes the preparation. Thus treated the wood is of a faint creamy tint with an appearance of semi-transparency. Beautiful gradations of tone were obtained by panels of this prepared pine, mouldings of holly, and stiles of curly or birdseye maple, and fine contrasts were made with the pine and oiled black walnut.

The pine is too soft for floors, but for doors, casings, and chamber furniture it seems to be admirably adapted. The finest specimens of the wood noted come from Michigan, having fewer pitchy streaks and being of a more uniform color than the Maine product. Its ease of working by carving, and the coherence of its grain, are being utilized by masters and amateurs in interior wood decorations. A beautiful carved mantel relieved by pilasters of oiled black walnut has been recently finished, which suggests the mellow tints of statuary marble after a short exposure to the atmosphere, while being free from the chilling sparkle and sheen of the marble.

Work of the British Association at Montreal.

After a most busy week, in which results were put on record of the recent work of a great number of savants in numerous departments of investigation, the British Association for the Advancement of Science closed up the business of its first meeting in America, at Montreal, September 3. The number of papers read has been great, and the discussions were always interesting, but there have been no such wonderful discoveries announced or original theories advanced as stand out so prominently in the *Transactions* of the British Association of many former years, as exemplified in Bessemer's thrilling description of how to make steel from cast iron without fuel, Sir William Siemens' accounts of his regenerative furnace and the Siemens-Martin modifications thereof, or of his bold advances in the field of electrical science, or the numerous and equally valuable contributions of Tyndall, Huxley, Sir William Thomson, and scores of others. It would not be just, however, to assume that on this account the work done indicates any less keenness in scientific research. Great discoveries do not come at regularly prescribed intervals, and perhaps the great amount of thorough examination and careful study of the ground already traversed, which the numerous papers read before the several sections indicate, are only the necessary preliminary work in clearing the way for still more important advances.

Among the papers read in the mathematical and physical science section, one that excited considerable attention was by Prof. O. J. Lodge, as to the seat of the electromotive force in the voltaic cell. Sir William Thomson said he regarded the paper as a landmark on the subject. Then Sir William threw some light on the matter from his own observation and experience, and he was followed by Profs. Fitzgerald, Silvanus Thompson, Dr. Fleming, Prof. Gibbs, and Drs. Schuster and Macallister. Mr. Preece, the head of the English telegraph system, came to the front in a discussion in a mathematical statement by Lord Rayleigh of the conditions necessary to use the Atlantic cables for telephone purposes, and Prof. Graham Bell sought for light on the subject. Mr. Preece, in the course of his remarks, ventured on the opinion that it was impracticable to use telephones with underground conductors for a distance greater than 12 miles.

In the chemical section, Prof. Frankland, the well known author, took up the subject of the batteries for the storage of electrical energy. While admitting the great loss of power in these batteries when not in use, he was disposed to think from his experiments that they have a brighter future than many electricians are willing to admit. After him came Prof. George F. Barker, who called attention to the shortcomings of the batteries, which, according to his calculation, do not return over 6 per cent of the energy put into them. Dr. Gladstone also spoke on the subject, but rather tentatively, as one waiting for results.

A paper before the geological section, by W. F. Stanley, F.G.S., had the following points: "The theory of Dr. Croll, accepted by many geologists, is that former glacial periods in the northern hemisphere were due to greater eccentricity of the earth's orbit and to this hemisphere being at the time of glaciation in winter perihelion. This theory is supported upon conditions that are stated to rule approximately at the present time in the southern hemisphere, which is assumed to be the colder. Recent researches by Ferrel and Dr. Hann, with the aid of temperature observations taken by the recent transit of Venus expeditions, have shown that the mean temperature of the southern hemisphere is equal to, if not higher, than the northern, the proportions be 15·4 southern, 15·3 northern. The conditions that rule in the south at the present time are a limited frozen area about the south pole not exceeding the sixtieth parallel of latitude, whereas in the north frozen ground in certain districts, as in Siberia and Northwestern Canada, extends beyond the fiftieth parallel; therefore by comparison the north, as regards the latitude in which Great Britain is situated, is at present the most glaciated hemisphere. As it is very difficult to conceive that the earth had at any former period a lower initial temperature, or that the sun possessed less heating power, glaciation in the north could never have depended upon the conditions argued in Dr. Croll's theory. The author suggested that glaciation within latitudes between 40° and 60° was probably at all periods a local phenomenon depending upon the direction taken by aerial and oceanic currents, as, for instance, Greenland is at present glaciated. Norway has a mild climate in the same latitude, the one being situated in the predominating Northern Atlantic currents, the other in the southern. Certain physical changes suggested in the distribution of land would reverse these conditions, and render Greenland the warmer climate, Norway the colder."

In regard to sunspots and terrestrial disturbances, Prof. Arthur Schuster, of Owens College, Manchester, said their periodicity was not regular. Sometimes they appear every eight years, and sometimes not for sixteen years. The period is about every eleven years. There is ground for believing that there are two periods of ten and a half and twelve years superposed on one another. Magnetic variations, that is, variations of the magnetic needle, occur at such times, which are quite marked. The magnetic needle points to the north and the south. It does this, however, approximately, and follows the course of the sun somewhat. In the morning it begins traveling westward, and in the afternoon it starts on its run to where it began. This daily excursion of the needle is much greater when there are many spots on the sun. The proportion in England is as three to two, and in Germany as seven to four. At times, too, the needle travels irregularly to and fro. These needle vibrations are magnetic storms. The speaker referred to the noted storms of 1859 and 1872, at the time of great outbursts on the sun, and said that if the sun were of solid steel, magnetized to the highest extent of which it is capable, it would not affect terrestrial phenomena to such an extent. It was rash to say that the space between the earth and the sun did not contain sufficient matter to conduct electricity from one to the other, but leaving electric influence out of the matter, because we know nothing of the subject, we come to the question, "Does the sun radiate more or less at the time of the prevalence of sun spots?" This was not definitely ascertained. The trouble has been in trying to ascertain the sun's radiant heat, and we have not been able to get rid of disturbing factors, one of which is the variance in the absorption, reflection, etc., in the atmosphere at different times of the day. Professor Schuster suggested the establishment of an observatory station on the Himalaya Mountains, about 20,000 feet above the level of the sea. He then pointed out the difficulties in the way of determining the solar heat, and called attention to the thermic curves. During the period between 1810 and 1860 there was a remarkable correspondence between the mean temperature curves and the prevalence of sun spots in unusual numbers. The good wine years on the Rhine corresponded with the years of minimum sun spots. Hot summers follow after a period of maximum sun spots. Destructive cyclones on the Indian Ocean, and around the West Indies, it has been observed, are greater in years of maximum sun spots. At the time of many sun spots there was seen a comparatively large number of comets around the sun. The speaker thought it not improbable that the periodicity of sun spots was produced in some way by meteoric streams whose orbits approached the sun at the times of the frequent sun spots. The address was discussed learnedly, and further light was thrown on the subject by Profs. Balfour, Stewart, and W. Lant Carpenter, who took up the matter of short periods common to solar and terrestrial phenomena, and a report was submitted on meteoric dust. Other matters discussed were the measurement of solar radiation and recent progress in photographing the solar spectrum. The Earl of Rosse explained an electrical control for equatorial driving clocks.

An interesting address before the chemical section was by D. W. H. Perkin, Ph.D., F.R.S., of Sudbury. He turned the room into a laboratory, and gave a most exhaustive address on coal tar coloring matters, which was illustrated by numerous experiments. The beautiful colors obtained from the various products of coal tar distillation were exhibited, the methods of manufacture and application explained, and reference was made to the discoveries of new ways of producing cheaply and abundantly the substances used in making the most brilliant dyes. The speaker colored strips of yarn, washed them, fixed the colors, and then exhibited them all in full view of the audience.

At the conclusion of the meeting there was a general scattering of the members, some going to the Rocky Mountains, the Yellowstone Valley, and other places of interest, while many left for Philadelphia to take part in the ensuing meeting of the American Association.

Meeting of the American Association, Philadelphia.

The thirty-third meeting of the American Association for the Advancement of Science commenced its sessions in Philadelphia, Sept. 4. Never before was there so large an attendance of American and foreign scientists as were assembled at the opening exercises in the Academy of Music, and this meeting has attracted public attention to an unwonted degree. At the commencement of the meeting Prof C. A. Young, of Princeton, retired from the presidency in favor of Prof. T. P. Lesley, of Philadelphia, the president elect, who gave a short account of the early history of the association, which was founded in 1840, as a geological society, under the presidency of Prof. Hitchcock. The style was afterward changed to the American Association of Geologists and Naturalists, and in 1847 its present name and plan of organization was adopted. The association held no meetings from 1861 to 1865, inclusive, during the period of the civil war.

The work of the association for the present meeting was assigned to the following sections, under the respective vice-presidents and secretaries named

A. Mathematics and Astronomy—H. T. Eddy, of Cincinnati; G. W. Hough, of Chicago.

B. Physics—John Trowbridge, of Cambridge; N. D. C. Hodges, of Salem.

C. Chemistry—John W. Langley, of Ann Arbor; R. B. Warder, of North Bend.

D. Mechanical Science—R. H. Thurston, of Hoboken; J. Burkitt Webb, of Ithaca.

E. Geology and Geography—N. H. Winchell, of Minneapolis; Eugene A. Smith, of Tuscaloosa.

F. Biology—E. D. Cope, of Philadelphia; C. E. Bessey, of Ames.

G. Histology and Microscopy—T. G. Wormley, of Philadelphia; Romeyn Hitchcock, of New York.

H. Anthropology—E. S. Morse, of Salem; W. H. Holmes, of Washington.

I. Economic Science and Statistics—John Eaton, of Washington; C. W. Smiley, of Washington.

At the opening exercises it was announced that more than 200 scientific papers had been filed for discussion. Beside the large number of members of the British Association present, there were delegates from the following societies:

Ornithologische Verein in Wien, Societe Entomologique de Belgique, Linnean Society, Belfast Natural History and Philosophical Society, Geological Survey of India, Royal Academy of Lucca, Asiatic Society of Bengal, Societe Anthropologique de Bruxelles, Association Française pour l'Avancement des Sciences, Asiatic Society of Japan, Royal Microscopical Society, Royal Irish Academy, Royal Geographical Society of Ireland, Philosophical Society of Glasgow, Natural History Society of Glasgow, Royal Botanical Society, Manchester Literary and Philosophical Society, Royal Society University of Japan, Royal Institution of Great Britain, Royal Zoological Society of Ireland, Royal Dublin Society, Botanical Society of Edinburgh, Zoological Society of London, Imperial Society of Friends of Natural Science, and Royal Academia del Lincei, Rome.

In the geological section, Prof. Winchell made an address on crystalline rocks of the Northwest, giving a review of the stratigraphic distinctions made by various authorities, correspondence of age, and conflicting nomenclatures. The Huronian, of Canada, he held to be the lowest of the Taconic groups in the Northwest. The uppermost of the groups is exceptional in character and variously named, confusion and conflict of authority having arisen in naming them.

Professor J. W. Langley, of Ann Arbor, in the chemical section, spoke on "Chemical Affinity." In the mathematical section H. T. Eddy, of Cincinnati, presiding, the address was on "College Mathematics; its Aims, Needs, and Relations to Scientific Research." In the section on histology and microscopy, the subject of the address was "Microscopy in Connection with Toxicology," special reference being made to its value in the detection of poisons and criminals. In the section on mechanical sciences, Prof. R. H. Thurston presiding, the address was upon the applied sciences. In the section on physics, Prof. John Trowbridge presiding, the subject of the address was the nature of electricity. In the biology section, Prof. E. D. Cope, of Philadelphia, made an important address, from which we extract as follows:

"The general proposition that life has preceded organization in the order of time may be regarded as established. It follows necessarily from the fact, which has been derived from paleontological investigation, that the simple forms have, with few sporadic exceptions, preceded the complex in the order of appearance on the earth. The history of the lowest and simplest animals will never be known on account of their perishability; but it is a safe inference, from what is known, that the earliest forms of life were the rhizopods, whose organization is not even cellular, and includes no organs whatever. Yet these creatures are alive, and authors familiar with them agree that they display among their vital qualities evidences of some degree of sensibility. . . . If, then, some form of matter other than protoplasm has been capable of sustaining the essential energy of life, it remains for future research to detect it, and to ascertain whether it has long existed as part of the earth's material substance or not. The heat of the earlier stages of our planet may have forbidden its presence, or it may not. If it were excluded from the earth in its first stages, we may recognize the validity of Sir William Thomson's suggestion that the physical basis of life may have reached us from some other region of the cosmos by transportation on a meteorite. If protoplasm in any form were essential to the introduction of life on our planet, this hypothesis becomes a necessary truth. Here let me refer to the fact that hydrocarbonaceous substances have been discovered in meteorites. Here, also, the remarkable discovery of Huggins claims attention. This veteran spectroscopist has detected the lines of some hydrocarbon vapor in the spectra of interplanetary spaces. The significance of this discovery is at once perceived, if we believe that hydrocarbons are only produced under the direction of life.

"Granting the existence of living protoplasm on the earth, there is little doubt that we have some of its earliest forms still with us. From these simplest of living beings both vegetable and animal kingdoms have been derived. But how was the distinction between the two lines of development, now so widely divergent, originally produced? The process is not difficult to imagine. The original plastid dissolved the salts of the earth and appropriated the gases of the atmosphere, and built for itself more protoplasm. Its energy was sufficient to overcome the chemism that binds the molecules of nitrogen and hydrogen in ammonia and of carbon and oxygen in carbonic dioxide. It apparently communicated to these molecules its own method of being, and raised the type of energy from the polar non-vital to the adaptive vital by the process. Thus it transformed the dead mineral world, perhaps by a process of invasion, as when a fire communicates itself from burning to not burning combustible material. Thus it has been doing ever since, but it has redeposited some of its gathered stores in various non-vital forms. Some of these are in organic forms, as cellulose; others are crystals imprisoned in its cells, while others are amorphous, as waxes, resins, and oils. But consciousness apparently early abandoned the vegetable line. Doubtless all the energies of vegetable protoplasm soon became automatic. The plants in general, in the persons of their protist ancestors, soon left a free swimming life and became sessile. Their lives thus became parasitic, more automatic, and in one sense degenerate.

"The animal line may have originated in this wise: Some individual protists, perhaps accidentally, devoured some of their fellows. The easy nutrition which ensued was probably pleasurable, and once enjoyed was repeated, and soon became a habit. The excess of energy thus saved from the laborious process of making protoplasm was available as the vehicle of an extended consciousness. From that day to this, consciousness has abandoned few if any members of the animal kingdom. In many of them it has specialized into more or less mind. Organization to subserve its needs has achieved a multifarious development. There is abundant evidence to show that the permanent and the successful forms have ever been those in which motion and sensibility have been preserved and most highly developed. This review of the history of living organisms has been epitomized in the following language: 'Evolution of living types is then a succession of elevation of platforms on which succeeding ones have built. The history of one horizon of life is that its own completion but prepares the way for a higher one, furnishing the latter with conditions of a still further development. Thus the vegetable kingdom died, so to speak, that the animal kingdom might live, having descended from an animal stage to subserve the function of food for animals. The successive types of animals first stimulated the development of the most susceptible to the conflict, in the struggle for existence, and afterward furnished them with food.'"

How to Buy a Horse.

An old horseman says: If you want to buy a horse, don't believe your own brother. Take no man's word for it. Your eye is your market. Don't buy a horse in harness. Unhitch him and take everything off but his halter, and lead him around. If he has a corn, or is stiff, or has any other failing, you can see it. Let him go by himself a way, and if he staves right into anything you know he is blind. No matter how clear and bright his eyes are, he can't see any more than a bat. Back him, too. Some horses show their weakness at tricks in that way when they don't in any other. But, be as smart as you can, you'll get caught sometimes. Even an expert gets stuck. A horse may look ever so nice and go a great pace, and yet have fits. There isn't a man could tell it till something happens. Or he may have a weak back. Give him the whip and off he goes for a mile or two, then all of a sudden he stops in the road. After a rest he starts again, but he soon stops for good, and nothing but a derrick could move him.

The weak points of a horse can be better discovered while standing than while moving.

If he is sound, he will stand firmly and squarely on his limbs without moving any of them, the feet flatly upon the ground, with legs plump and naturally poised; or if the foot is lifted from the ground and the weight taken from it, disease may be suspected, or at least tenderness, which is a precursor of disease. If the horse stands with his feet spread apart, or straddles with his hind legs, there is a weakness in the loins, and the kidneys are disordered. Heavy pulling bends the knees. Bluish, milky cast eyes in horses indicate moon blindness or something else. A bad tempered horse keeps his ears thrown back. A kicking horse is apt to have scarred legs. A stumbling horse has blemished knees. When the skin is rough and harsh, and does not move easily to the touch, the horse is a heavy eater, and digestion is bad. Never buy a horse whose breathing organs are at all impaired. Place your ear at the side of the heart, and if a wheezing sound is heard it is an indication of trouble.—*Rural Record.*

DRIVING MECHANISM FOR VELOCIPEDES.

The improvement herewith illustrated, which may be applied as well to bicycles as velocipedes, provides a simple and efficient clutch mechanism, connecting the axle with an operating treadle or lever, one that answers quickly to the force used on the driving treadle in impelling the vehicle forward, and which will readily adjust itself for the next stroke, irrespective of the length of the stroke of the treadle. The clutch mechanism is made with an inner disk fixed to the vehicle axle, with a grip flange against which a clutch block held loosely in an outer loose disk is adapted to act when the lose disk is partially rotated by a coiled spring, which is fixed at one end to the loose disk and connected at the other end to the operating treadle or lever. The clutch block is so held as to be always in position to instantly act on the flange of the fixed disk as it is carried around, and forced by a pin against the flange.

The smaller view in one engraving represents a longitudinal section of the clutch mechanism, A being the axle, and B the inner disk section rigidly secured thereto. C is a projection from the outer loose disk, and has a transverse slot or recess in which is fitted quite loosely the clutch block, D, E being a backwardly extending face or rim of the outer disk, having side flanges to serve as edge guides to the spring, F, the inner end of which is fixed to the rim in any suitable manner. The outer end of the spring is connected with the lever or treadle bar, H, and the small spiral spring, G, serves to hold the clutch block yieldingly to the disk. In bicycles this clutch mechanism is to be arranged on the axle at both sides of the main wheel.

DE BEAULIEU'S DRIVING MECHANISM FOR VELOCIPEDES.

This invention has been patented by Mr. George De Beaulieu, of No. 139 Maumee Avenue, Toledo, O.

A SPECIES of rice has been discovered in Mantchuria which can be cultivated without irrigation, and consequently without risk to the health of the district. Whether it is equally productive with the common species remains an open question.

TIGHTENING DEVICE FOR TRUNK STRAPS.

Those who have vainly endeavored to strap a well packed trunk will welcome a device recently patented by Mr. Nels K. Pearson, of 246 Taylor Street, San Francisco, Cal. One end of the strap is secured to one end of a long casing, while the opposite end is secured to the end of a plate which is adapted to slide in the casing. The plate is formed on its upper surface with a worm rack, which engages with a worm gear on a spindle journaled in the end piece of the casing. Mounted on one end of the spindle is a worm wheel which engages with a wheel mounted on a shaft at right angles to the spindle, and provided with a squared end for receiving a crank. The strap is furnished with a buckle for adjusting it in length before tightening it. By turning the crank the slide plate is drawn into the casing, thereby

PEARSON'S TIGHTENING DEVICE FOR TRUNK STRAPS.

tightening the strap as much as may be desired, and locking it in position by means of the worm spindle and rack. Moving the crank or key in the opposite direction loosens the strap.

Gold in Norway.

The recently discovered gold mines at Bommelo, in Scandinavia, are at present a subject of great interest in the North. A correspondent of the Norwegian *Dagblad*, who has recently paid a visit to the district, describes the place as being still very primitive; but according to an old English gold digger, who has seen a good deal of digging in America, Australia, and Africa, the Bommelo mines are among the most promising he has ever come across. In his mind's eye this veteran gold digger sees in the dwelling houses which are rapidly springing up the foundation of a future city, with factory chimneys, spires, schools, and theaters. "But those things take time," he says, "like a lawyer's way to heaven."

And he rejoices in this fact, for he "does not like civilization." If there is really gold at Bommelo, his rejoicing will be brief.

Extent and Resources of Great Britain.

Those who are looking for statistics may find some rather striking figures in the address recently delivered by Sir Richard Temple on "Economic Science and Statistics" before the British Association at Montreal. On this authority it appears that the area of the British Empire is eight and a half million square miles. Including countries politically under its control, such as Egypt, Zululand, and Afghanistan, the total amounts to ten million square miles, or one-fifth of the habitable globe. One-quarter of this area has been topographically surveyed. The total coast line is 28,500 miles, with 48 large harbors. Only one-fifth of the area is cultivated or occupied. There is room enough in Canada and Australia to support a population of 200,000,000. The total population of the empire amounts to 315,000,000, of which 39,000,000 are Anglo-Saxons and 188,000,000 are Hindoos. The annual revenue amounts to £203,000,000, of which sum £89,000,000 come from the United Kingdom, £74,000,000 from India, and £40,000,000 from the colonies and dependencies. Only one-fourth of the total revenue is derived from land taxation. Including local taxation the revenue is £264,000,000, and amounts to £1 5s. 4d. per head per annum. The number of men trained to arms amounts to 850,000, about 700,000 of these being of the fair or dominant race. The defensive armaments by sea and land cost £41,000,000 annually, which is less than that shown by any great State in the world except the United States. There are 560,000 policemen in the empire, 1 to every 571 inhabitants and to every 16 square miles. There are 246 war vessels and 30,000 merchant ships manned by 270,000 sailors. The factory steam power in the world is represented by 7,500,000 horse power; of that total 2,250,000, or about 30 per cent, is British. If the main elements of national industry be taken together—namely, commerce, manufactures, mining, agriculture, carrying trade, and banking—the total £2,000,000,000 and upward annually is about the same for the United Kingdom and the United States. But the United States are advancing the fastest, and are already passing ahead. There are 675,000 persons convicted annually of crime in the empire, of which number more than nineteen-twentieths pertain to India. The number of paupers in the United Kingdom under relief amounts to 1,000,000, or rather less than one-thirtieth of the population, and the cost of their maintenance is £10,000,000 sterling annually. In regard to the Post Office, the letters posted annually in the world are 5,200,000,000; of this total 1,500,000,000, or 34 per cent, are in the British empire. Respecting education, there are 5,250,000 pupils at schools in the United Kingdom, 860,000 in Canada, 611,000 in Australia, and 2,200,000 in India, making a total of 8,921,000 pupils in the British Empire.

The Krupp Foundry at Essen.

Some interesting figures with regard to the growth of the establishment belonging to Herr Krupp at Essen have just been published. In 1860 the Essen foundry had only 1,764 workmen, but that number had risen to 7,084 ten years later, and it is now upward of 20,000. Counting the women and children, Herr Krupp's establishment gives employment to 65,381 persons, of whom 29,000 live in houses belonging to their employer. The foundry is divided into eight sections, and their are 11 blast furnaces, 1,542 other furnaces, 439 steam boilers, 82 steam hammers, and 450 steam engines representing 185,000 horse power. At Essen alone, to say nothing of the branch establishments, there are nearly 40 miles of rails, 28 locomotives, 883 trucks, 69 horses, 191 wagons, 40 miles of telegraph wires, 35 telegraph stations, and 55 Morse instruments.

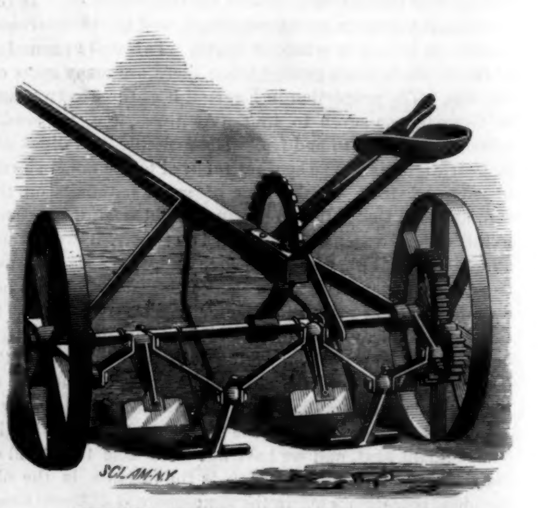
A Subterranean Fish.

An interesting fact in natural history is announced by Cavalier Moerath, an Italian civil engineer. While engaged in prospecting for water in Italy, M. Moerath tapped a spring with a drive well, and to his surprise pumped out of it a tiny living fish. The fish had passed from the spring through perforations in the pump of one-eighth inch diameter. It was found to be destitute of eyes, showing that it belonged to a subterranean species.

SULKY CORNSTALK CUTTER.

The tongue is connected to the axle by three bars, the lower ends of which have round holes formed through them to fit upon bearing boxes, the interiors of which are made square to fit upon the square axle. These bearing boxes are made sufficiently long to receive upon their outer ends the forward ends of arms which are adjustably secured by set screws. Upon the rear ends of these arms are bearing boxes which fit upon pivots having squared ends, and to which the end sections of the crank shaft are secured by bolts. These end sections are made short and the intermediate sections long; the crank shaft is formed of five sections, the adjacent ends of which are connected by bolts, pivots, and bearing boxes, constructed as above described. Upon the intermediate bearing boxes are placed the upper ends of knife arms, secured by set screws, and to the lower ends of which the cutters are bolted, so that the latter will be moved up and down as the shaft revolves. Rods connect the forward sides of the knife arms to the axle, so that they will be kept in proper position while being raised up and down. Upon the outer end of one of the side pivots is placed a small gear wheel meshing with a larger wheel, mounted loosely upon the hub of the drive wheel, to which are pivoted hook pawls that engage with slots in the rim of a disk upon the hub of the drive wheel.

When it is desired that the shaft shall not rotate, the pawls are turned back from the disk. Attached rigidly to the shaft is an arm, the outer end of which is connected by a rod to a lever pivoted to the side of the tongue. The lever passes alongside of an arched catch bar having teeth upon its edge, with which a pawl on the lever engages. By adjusting this lever, the crank shaft can be raised or lowered to cause the



GILLET'S SULKY CORNSTALK CUTTER.

cutters to enter the ground to a greater or less depth, and can be raised so that the cutters will clear the ground. Any stalks that may lie across the rows are straightened by two hooks attached to arms joined to the under side of the tongue. The seat is secured, as plainly shown in the engraving.

This invention has been patented by Mr. A. F. Gillet, of Burlington Junction, Mo.

APPARATUS FOR HYDRATING LIME.

It is useless to dwell upon the advantages that are derived from the use of very pure milk of lime free from stones, in sugar works. For replacing manual labor and all the instruments that now serve for manufacturing this product, Mr. L. Wackerwie has devised an apparatus which does the work mechanically and economically, and which may be used indifferently for the preparation of lime in paste, in milk, or in powder.

In this apparatus, which is shown in the accompanying cut, three operations are performed, to wit: (1) the slaking of the lime; (2) the straining of the preceding product; and (3) the stirring of the milk or paste.

The hydrator, A, consists of a receptacle that contains an Archimedes screw, and is provided with injecting pipes which receive water through a cock connected with a conduit. The quick lime, with which the entire capacity of the hydrator has previously been filled, is slaked by means of the injected water, and, when reduced to a paste, is emptied into the lower cylinder, B, through the motion of a helix.

The straining cylinder allows the milk or paste to escape, but retains all the impurities, such as the unburned portions, the rubbish, and the debris of coke or coal. A propeller, which is placed in the interior of the cylinder, causes all these solid materials to travel toward the exit end, where a plug moved by a lever permits of their being removed.

Those portions of the lime in powder, paste, or milk, that traverse the perforations in the cylinder fall into the lower trough, where they undergo a vigorous stirring in order to convert them into milk of a density that is determined by the needs of the works.

Nothing can flow through the blow-off cock adapted to the receiving trough but very uniform milk of lime, absolutely free from stones, since the few impurities that may have traversed the meshes of the cylinder deposit in the lower space protected from the action of the blades of the agitator. This deposit is afterward removed by means of a scraper.

The apparatus takes up but little space, and does not require much power to run it. One man suffices to feed and maneuver it. The discharge is considerable, and the milk of lime is always uniform. The unburned portions are eliminated automatically, and the real lime is entirely utilized.

If we compare these advantages with the inconveniences that attend the usual mode of preparing milk of lime in sugar works, it may be easily seen that the apparatus is called upon to render a genuine service.

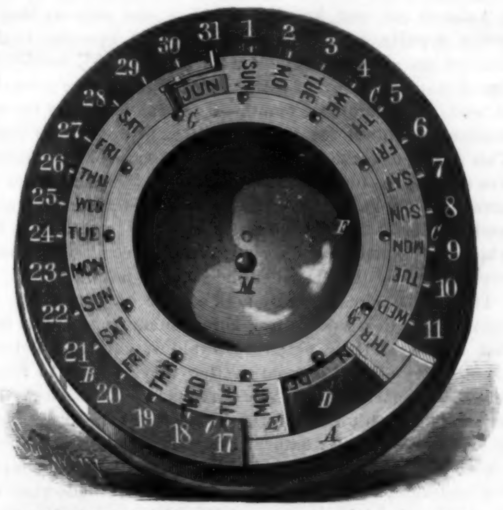
Aside from its applications in sugar works and distilleries, the apparatus is adapted for manufacturing hydraulic lime, cements, and ceramic pastes. When it is desired to obtain lime in powder, the agitator is replaced by a helix which sends the product to a bagging apparatus.—*Revue Industrielle.*

An Electric Torpedo Boat.

A nondescript craft has been lying the last few days at the Delamater Works, foot of West 13th Street, this city. She is a torpedo boat, built of steel, 30 feet in length, 7 feet 6 inches in beam, and 6 feet deep. She is to be run by storage batteries and lit by electricity. The method of firing the torpedoes is thus outlined: She is to have a torpedo at each end, fastened to the deck by a detaching apparatus. They are to be connected by a chain and to have an electric wire attached to each. They are fitted with cork floats, which cause them to rise as soon as detached from the deck, and over the cork are powerful magnets which will cause them to adhere to the bilges of the ship to be destroyed. The boat is then steamed off to a safe distance, and there an electric current sent through the wires explodes the torpedoes. The boat will, it is calculated, go at the rate of about eight miles an hour. A partial trial has been had with her in the North River. When complete she will be taken by Prof. J. H. L. Tuck, and made to give a submarine exhibition by exploding some old hulk or sunken canal boat. She carries compressed air, and has tubes that can be sent up from a depth of 20 feet under water, for a fresh supply.

COMBINED CALENDAR, PAPER WEIGHT, ETC.

A cylindrical cup, A, has a flat annular rim provided with thirty-one notches, C, marked from 1 to 31. Within the cup



COMBINED CALENDAR, PAPER WEIGHT ETC.

is placed a tubular section, D, open at the top and bottom, and provided with an annular rim plate, E, which projects into a recess formed on the top edge of a cup, F, within the tubular section. Twelve apertures, G, are arranged equidistant in the top edge of the cup. On the rim, E, is pivoted a latch, the end pin of which passes into one of the apertures, G, to lock the cup in place in relation to the tubular section; on the rim is also pivoted a latch which passes into one of the notches, C, to lock the tubular section in place in relation to the cup In the inner edge of the rim a recess is formed. On the top of the rim the initials of the days of the week are produced; and on the top edge of the cup, and below the rim, the names of the months are produced. The cup, F, is joined to the cup, A, by the pivot, M, secured to the inner cup and provided on its lower end with a handle turning in a recess in the under side of cup, A.

To adjust the calendar the inner latch is raised, and by means of the handle the cup, F, is turned until the desired month shows in the recess. The outer latch is then raised, and the cup, F, and tubular section, D, are turned together until the correct initial day of the week on the rim, E, is opposite the correct numeral. The cavity in the cup serves as a pin holder, and the entire device, which may be of wood, metal, or glass, serves as a paper weight.

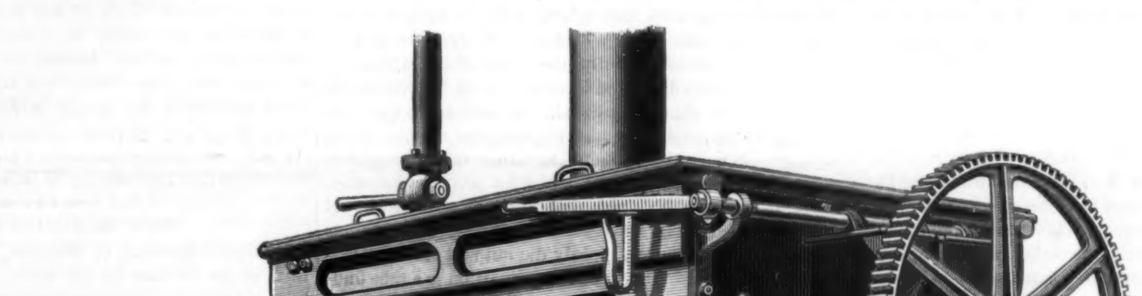
This invention has been patented by Mr. W. A. Haywood, of Savannah, Ga.

A Smoke Consuming Locomotive.

An engine of a novel type, designed by Charles B. Coventry, has recently been constructed by the Brooks Locomotive Works, for the Chicago Locomotive Improvement Company. The headlight is placed where the stack generally is, while the stack is at the rear of the boiler and close to the cab. The boiler is one of the largest manufactured (what is known as a 60 inch shell), and the smoke, gas, etc., traverse it twice, along the bottom and over back on top to the stack. This makes such a good combustion that the finer particles of fuel, the gas, and the smoke are almost entirely consumed, and when the engine is going at full speed, it is impossible to see any smoke. The smoke stack itself is very small, being not more than seven or eight inches in diameter. Among the advantages of this invention it is said it gets a steady, even draught, reduces the waste of fuel to a minimum, and throws no cinders, sparks, or fire. The locomotive is peculiar in appearance, but it is said that it does its work well. It weighs forty tons.

Old Guns.

About 120 old style muzzle loading 58 caliber Springfield rifles are now dismantled at our armory daily, and such parts as fit the new breech loading model are reused. The guns thus taken to pieces are part of the 500,000 old style rifles made at the armory during the war, and stored there unused after 1865. The dismantling began in 1868, when it was found that the whole gun could be sold in the market for only $1.50, while the parts which could be used in the new model, together with the sale of the remainder as scrap iron to shot gun makers, would net the government about $4.00. The parts sold are mainly the stock and barrel and scrap material, and most of these parts go to manufacturers of cheap shot guns. The Whitney Company, of New Haven, and the Remington Company, of Ilion, N. Y., are large buyers. The 50 caliber rifles, which were first made in 1866, of which only 50,000 were manufactured, were never stored, but went at once into active service, and have been mainly worn out in it. There are now stored at the armory about 50,000 of the 58 caliber model, and 158,000 dismantled barrels and 128,000 stocks. About 50,000 "cleaned and repaired" 58 model rifles are also stored, but will not be dismantled, as they are mainly contract guns and have seen such rough service in the field as to make it inadvisable to use their parts in new rifles.—*Springfield Republican.*



APPARATUS FOR HYDRATING LIME.

Too Much Water.

As a passenger train on the Painesville and Youngstown Railroad was at Youngstown, O., and just as it was pulling away from a water tank, a valve in the latter broke, sending an 8 inch stream of water against the train, breaking all the windows and deluging the coaches. Many of the passengers, with their clothing thoroughly water soaked, leaped from the train, rolling down an embankment, and some were bruised. Several ladies in the train had their dresses ruined.

THE Municipal Council of Paris has decided that one of the new streets of the Thirteenth Arrondissement shall be named Giffard, in commemoration of the inventor of the injector.

THE SHIPMAN STEAM ENGINE.

(Continued from first page.)

is lost by radiation. The fuel is kerosene of a grade that costs at retail from 8 to 10 cents per gallon. The fire is formed by the pressure of air or steam flowing through an atomizer, which throws the kerosene in a very fine spray into the fire box in the boiler. The combustion is complete and the heat is intense. The oil is consumed without the agency of wicks. The diaphragm invented especially for this engine controls the fire so that an even pressure of any desired amount can be carried at all times.

To illustrate: If 100 pounds of steam are required, the diaphragm is set so that the pressure would put out the fire at 105 pounds. When the engine is running and doing no work, the steam gauge will indicate about 100 pounds and fire will be burning very low, because the engine would be using but little steam. This is because the diaphragm is nearly closed by the pressure in the boiler.

If the engine stops, the steam gauge would go up a pound or two, and this would close the diaphragm and put the fire out, for the reason that the diaphragm when closed disconnects the steam from the atomizer, and no oil is sprayed—hence no fire. If the engine be started, this relieves pressure from diaphragm; it opens, steam again goes to atomizer and atomizes the oil, and from a small taper, arranged for the purpose, the fire is again burning sufficiently for the amount of steam you are using.

Having shown the results when engine is running light and then stopped, we now take the opposite view, and suppose the engine to be running light and we take more power from it; the result is we are taking steam from boiler faster than the small fire makes it. This at once gives relief to our diaphragm, it opens wider, and we get a hotter fire, so that should we use its full power it would allow diaphragm to open far enough to get full blast of fire. This is a practical automatic regulator, and acts as a safeguard against overpressure in the boiler. Besides this, a safety or pop valve is applied.

A further peculiarity of this boiler is an automatic water regulator, operating to maintain a uniform amount of water in the boiler, and thus providing another safeguard against accident. In a small reservoir on the side of the boiler is a float, connected by levers with the pump valve. By this means the water is kept at the proper height. That one may be sure that the regulator is in working order, a water glass is attached to the side of the reservoir to show how much water there is in the boiler. At the top of this regulator the steam gauge is attached, which shows the amount of steam carried, and how the diaphragm works.

Power of most efficiency is obtained by using the steam as dry as possible. This the Shipman plan facilitates, as the fire passes around the tubes that hold the steam, as well as those that have the water in them. This peculiar construction of boiler and engine, therefore, makes the steam dry, as well as almost entirely prevents condensation or waste by long ports in cylinder.

The cylinder and all working parts are incased in a steam tight box. Thus all air is kept from cylinder, and the exhaust steam around it keeps it hot.

A practical automatic self-oiler is attached to the steam pipe, and a spray of oil is constantly thrown over all the bearings, thus making excellent lubrication.

The cylinders are placed one above the other, with the steam chest between. The piston heads are both on the same rod, and take steam only on one side, and so require but one valve. By means of auxiliary ports the steam escapes from the cylinders as soon as the piston has reached the end of the stroke; in this way only a small portion of the steam returns through the valve ports, and more work is said to be obtained from this engine, under a given boiler pressure, than from any other. The engine has a centrifugal governor attached directly to the valve eccentric to decrease the throw of the valve as the speed of the engine increases, and give an earlier cut-off, using less steam. The pitman is connected directly with the lower piston head. This reduces the number of parts and also the friction. The pump is made of brass and of regular engine pump form, with lift and force valves. The plunger is connected directly to main shaft by an eccentric, and in connection with water regulator keeps boiler supplied with proper amount of water.

The Shipman engine for propelling boats for pleasure purposes has been largely preferred, in that it requires so little space in the boat.

Among the classes of machinery to which this engine has been attached and successfully run may be particularly mentioned the following: Boats, printing presses, fans, ice-cream freezers, laundry work, telephone electric generators, circular saws, cutting feed, pumps, tricycles, coffee mills, carpenter shop, dynamos, binders, blowers, apple parers, organs, churns.

The dimensions of engine No. 2, all set up, are as follows: 34 inches long, 17¼ inches high, 13¾ inches wide.

Two gallons of kerosene will, it is calculated, run a one horse power engine ten hours, at a cost of only about 15 cents per day.

The Shipman Engine Company at 55 Franklin Street, Boston, Mass., early in August sent one of their one horse power engines to Thomas Reber, Esq., of Louisville, Ky., to place in the Southern Exposition, and Mr. R. writes as follows of its performance: "I am making meal and grits with a nice little bolter; the bolter with the engine attracts and interests the farmers and stock men and country storekeepers. I have a corn sheller that shells the corn as fast as I can feed it; then, too, I have a rip saw attached to the pulley, and I can work all these machines at the same time if I don't crowd the saw. I also have a jig saw, turning lathe, and a matcher head, which I sometimes put on in place of circular saw. The little engine works like a charm, and is the greatest curiosity here."

The Sense of Taste.

BY GRANT ALLEN.

Animals eat, and, broadly speaking, one may say that a better popular definition of what is most essential to the idea of an animal as opposed to a plant could hardly be found than this habit of eating. In all the higher animals, at least, to eat implies a mouth—a special organ for the reception and often for the trituration of the natural food. This mouth is usually supplied with a tongue or discriminative service, the object of which is to enable the animal at once to distinguish between food that is good for it and food that is useless or positively injurious. The sense by which the animal thus discriminates between possible and impossible foodstuffs is called the sense of taste.

The lowest animals hardly need a sense of taste at all, at least in the developed form here contemplated; all is fish that comes to their net; they swallow, and, if possible, digest every bit of organic matter they happen to come across in the course of their aimless peregrinations. Or, rather, they swallow whatever is smaller than themselves, and get swallowed by whatever is larger. Still, even in these lowest depths of animal evolution, we get in a very simple and undeveloped form some first, faint foreshadowing of the faculty which becomes specialized later on into the sense of taste. When floating jelly bag meets floating plantlet or floating jelly speck under the microscope, it makes an effort to envelop the edible morsel all round with its own matter. But when it meets mineral bodies or uneatable things generally, it either does not try to envelop them at all, or if it costs them for a moment it soon rejects them as of no practical use for its own purposes. These simplest rudimentary animals, besides being all mouth and all stomach, are also all nerve and all sense organ. Every part of them seems to possess in some feeble manner the power of discriminating between what is food and what is useless.

In the higher animals, side by side with the evolution of a definite mouth, jaws, teeth, stomach, and digestive and assimilative mechanism generally, the power of discriminating food has been specialized and localized in the tongue, at the very front of the alimentary canal. In each species of animal, natural selection has insured that the nerves of the tongue should correctly in the main inform the animal what foodstuffs were desirable for it, and what were undesirable. Clearly, if it were conceivable that a race of animals should be so constituted that it liked poisons and disliked nutritious substances, that race must rapidly die out and leave no survivors. On the other hand, just in proportion as a race finds the indications of its sense of taste in harmony with the physiological effects of things swallowed, in that proportion must it tend (other things equal) to prosper in life, and to hand on its own discriminative powers to later generations.

In the human species the gustatory tract has been divided by Prof. Bain into three regions, each of which has its own special and proper functions to perform in the economy of tasting. The tip of the tongue is mostly supplied with nerves which are really rather nerves of touch than nerves of taste, and which are cognizant for the most part of pungent, acrid, or saline bodies. Obviously this arrangement conduces to the greatest safety of the mouth and stomach. The very first thing we want to know about any substance which we think of swallowing is whether it is immediately destructive of the bodily tissues. Now, the nerves of touch distributed to the tip of the tongue instantly inform us on this important primary question. In tasting an unknown substance, indeed, we all of us instinctively try it beforehand by touching it very lightly with the tip of the tongue. If it is caustic, like vitriol, or pungent, like cayenne and mustard, or fiery, like spirits of wine, or warping, like borax or alum, the tip of the tongue instantaneously warns us that it is not a fitting substance to be swallowed wholesale. This chemical sensibility of the nerves of the tongue is only a modified form of the general chemical sensibility of the whole body. Mustard, made into a plaster, acts on the skin very much as it acts on the tongue, only less rapidly and less specifically. The warping effect of alkalies can be felt on any part of the body, and the fiery character of alcohol faintly affects the nerves of touch in the same manner as the nerves of taste. In short, the sensitiveness of the tongue in this respect is only an intensified form of the common sensitiveness of nerves generally.

When a substance has passed the first examination with the tip of the tongue, and has been pronounced harmless, it is handed over to the middle region, supplied with the nerves of taste proper. It is the special function of these nerves to discriminate between sweet and bitter objects, as well as between various tasty substances which we know distinctively as flavors. On the whole, it is clear that human beings like sweets, that the tongue responds favorably to the class of foods which contain sugar as a principal element. The reason for this strongly marked preference is probably to be found in the ancestral fruit-eating habits of our race. To our early arboreal progenitors fruits were, of course, almost the only sweet objects known; they had as yet no sugar factories, and they doubtless seldom tasted even honey in the honeycomb. Hence it was natural that the presence of sugar should come to be the instinctive test, as it were, for the edibility of whatever object they happened to come across. In our modern artificial condition, where we use sugar to excess, and often in too concentrated forms, taste alone no longer acts as a safe guide; as children we eat too many sweetmeats, and in adult life we have no digestions; but that is only because we have altered the natural conditions, and have separated the sugar from the other wholesome food with which it is usually combined under its original circumstances. On the other hand, almost all bitter substances in the vegetable world are known to be poisonous, and our repugnance to bitter tastes is thus due to the registered experience of countless generations of early human or præhuman ancestors.

The third and lowest region of the tongue is the one cognizant of pleasures and pains in immediate sympathy with the stomach. The feelings we experience in this part of our throats can scarcely be properly described as tastes; they are best characterized, in Professor Bain's well chosen language, as relishes and disgusts. When we have begun to chew a piece of wholesome beefsteak in healthy hunger, we are conscious of a certain pleasurable sensation as it reaches the back of the tongue which induces us to persevere with the action of swallowing, and finally commit it to the digestive apparatus. On the other hand, when we take a dose of codliver oil, we are conscious, at the same stage in the proceedings, of a certain physical repulsion to the act of swallowing it; something seems to rise up instinctively in the throat which warns us that codliver oil is a remarkably difficult substance to digest and assimilate. The sensations thus experienced are purely premonitory of the effect of the food taken upon the stomach. Accordingly, they vary much, according to our state of health or appetite. However seasick we may be, pungent things are still pungent to us, acid things acid, bitter things bitter, and sweet things sweet. But meat, fat, oils, and so forth produce effects very different from their ordinary results. The tastes discriminated by the lower part of the tongue are all of this character; and the things which find it most difficult to pass the final examination here are tainted or putrid meats, very rich or buttery dishes, and other indigestible or bilious substances.

Thus we may say roughly that the threshold of the mouth warns us against whatever will prove absolutely destructive to the tissues generally; the central region distinguishes between what is ordinary human food and what is poisonous or otherwise deleterious when taken internally; and the lower portion of the tongue and throat pronounces finally upon the digestibility and fitness for the stomach (in its passing condition) of the food which has successfully passed the two earlier preliminary examinations.—*Knowledge.*

New Radiation Furnace.

Frederick Siemens, of Dresden, has designed a modified form of gas furnace for the more perfect utilization of the heat of radiation. This modification has now been perfected with special reference to glass furnaces. The inventor states that, in gas furnaces as usually constructed and worked, the flame is directed on and caused to strike the objects or materials to be heated. This course often results in damage to the materials acted upon, or to the crucibles or other vessels containing them, either by the chemical action of the substances in combustion or by the mechanical action of solid particles carried with the flame.

Moreover, when a flame directly impinges on objects colder than itself, combustion is rendered imperfect, and considerable waste of fuel is the result. Mr. Siemens' design is intended to avoid all these evils by keeping the flame entirely clear from the objects or materials to be heated, and as much as possible from the furnace walls, so that the whole of the heat is obtained by radiation from the flame itself and from the roof and walls of the furnace chamber, which are heated by radiation from it. Furnaces worked in this manner may be of various forms; the idea always being to obtain a considerable length of travel for a flame of large volume moving slowly in a line which keeps it as clear as possible from the walls, roof, or bed of the furnace chamber. Stress is laid upon the slow motion of the flame. There is nothing unusual about the arrangements for generating gas, or regenerating heat by the products of combustion; but in glass furnaces, for example, the gas and air inlets are above the level of the pots, yet below the roofs of the furnaces. The waste flues are similarly placed. The inventor repeats, as an essential feature of his invention, in whatever form applied, that the main object aimed at is "to prevent contact of the actual flame with any surface or object that is stationary or is colder than itself, as such contact interferes with the completeness of the combustion, and consequently reduces the heat radiating power."

When the flame ceases, however, the invisible products of combustion retain a large amount of heat; and the process of combustion having been completed when the condition of invisibility is reached, the said products may then be employed to heat objects by actual contact. Thus it is evidently Mr. Siemens' principal idea that in no circumstances should a gaseous flame be allowed to touch the objects which it is intended to heat.

MR. MAXWELL HALL (*Monthly Notices of the Royal Astronomical Society*) gives the following remarkable sequence of color in the planets from the earth outward: *Mars*, reddish; *Jupiter*, a delicate orange; *Saturn*, greenish-yellow; *Uranus*, light green; and *Neptune*, slightly blue.

Correspondence.

The Patent Office Deficiency.

To the Editor of the Scientific American:

Is not the present time—when members of Congress are mostly at home, and before they are absorbed in questions in which they see political capital—to again remind your many readers of the desirability of personal interrogation of their representatives, of the cause of delay in Patent Office action, and especially as to whether prompt action could be secured by adequate appropriation from the $3,000,000 excess of patent fees over expenditures, and why such appropriation is not made?

G. H. KNIGHT.

Cincinnati, O., Aug. 28, 1884.

Erroneous Interpretation of the Label Law by the Patent Office.

To the Editor of the Scientific American:

I notice in two of the August numbers of your valuable journal some interesting articles respecting the registration of labels in the Patent Office. Permit me as a lawyer having such questions frequently brought before me to give you my views, as I think the matter of sufficient importance to be somewhat further discussed in public.

Section 3 of the Act of June 18, 1874, merely transfers a portion of what before was registrable with the Librarian of Congress to the Patent Office; and the statute is merely declaratory when it says in substance that no trade mark shall be so registrable. No doubt, whenever a trade mark, as such, is offered in the guise of a label, the registration thereof is void in law. The Commissioner, however, should act ministerially in receiving all registrations of labels declared by the registrant's petition as such, leaving the courts to determine in the particular case litigated whether the subject matter is or is not a label. We should proceed just as was the practice with the Librarian of Congress previously; for the 3d section says that he is charged with such registration, "in conformity with the regulations provided by law as to copyrights and prints." The applicant furnishes a form or specimen of label, and makes oath that it is a label which he desires registered. The Commissioner ought not to go behind *that* statement, as it satisfies the statute so far as he is concerned. Should he do so, he acts as judge and thereby prevents a proper adjudication of the registration in the various courts having jurisdiction thereof, thus working an injury to the person seeking the registration.

The object of the law was no doubt to prevent the registration of a trade mark at a fee of $6, as under the the existing statute for registration of trade marks $25 Government fee had to be paid. To prevent this, in other words, to render void in law such a registration, was the cause of the insertion in section 3 by Congress of the words "not a trade mark." It should be borne in mind in this connection that at the date of the passage of this act relative to registration in Patent Office of labels, the first trade mark statute had not been declared invalid by the U. S. Supreme Court.

Assuming that the Commissioner of Patents has discretion to deny the registration, he ought not to do so merely because the trade mark forms part of the label. The trade mark is not the part protected by the payment of the $6: it is the whole of the label, of which the trade mark forms incidentally a portion. To deny this registration of the label until the arbitrary word found therein, and composing a trade mark in itself, is removed is, I think, proceeding contrary to the statute, instead of "in conformity with the regulations provided by law as to copyrights and prints."

LAWYER.

N. Y., Sept. 1, 1884.

An Appreciative Client.

On the 19th of last month (August), there was issued to B. F. Wright, editor and proprietor of the *Nemaha Monitor*, published at Oneida, Kansas, a patent on a steam boiler of peculiar construction, and possessing many novel features. In the last issue of his paper Mr. Wright pays the following unsolicited compliment to his attorneys:

"We take pleasure in referring those who contemplate making applications for patents, to Messrs. Munn & Co., of 361 Broadway, New York city. They acted as our attorneys in an application for patent on steam boiler, and secured the patent on broad and well protected claims, fully equal to our expectations. Although our invention was somewhat difficult of explanation, and some minor points explained by letter, they seemed to have thoroughly understood its principles and workings. The drawings clearly embrace every feature, while the specifications clearly and definitely point out every feature and manner of operation, thoroughly protecting every claim.

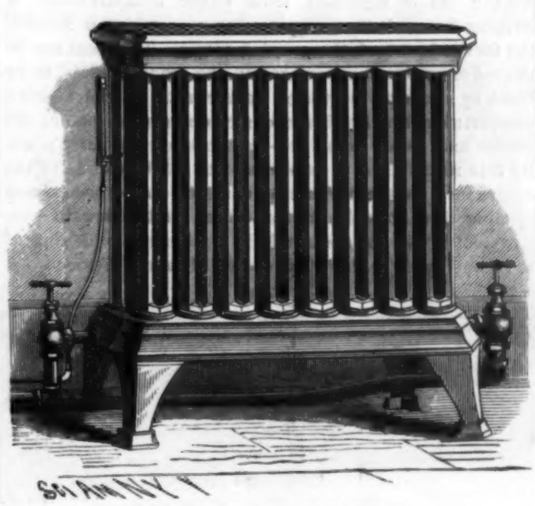
"We feel safe in recommending them as reliable and competent attorneys."

The Jumping Bean, or Devil Bean.

We notice that several of the daily papers are publishing accounts of this curiosity as if it were something newly discovered. A full account of its origin and the cause of its movements, illustrated with figures, will be found in SCIENTIFIC AMERICAN SUPPLEMENT, No. 106. To be had at this office for 10 cents.

RADIATORS FOR HEATING BUILDINGS.

There are but few houses now built in cities, either for dwellings, business purposes, or public use, which are not supplied with radiators for heating. The various forms in which they are built are calculated to give the greatest amount of heating surface for the smallest possible floor space, and so they will present a not unattractive appearance. The illustration we give herewith shows a small but very efficient one, the Bundy patent radiator, which is in use in the SCIENTIFIC AMERICAN office. More than half a million of this same make of radiators are now in use, having been adopted in many of the finest buildings in New York city. The joints cannot be affected by expansion or



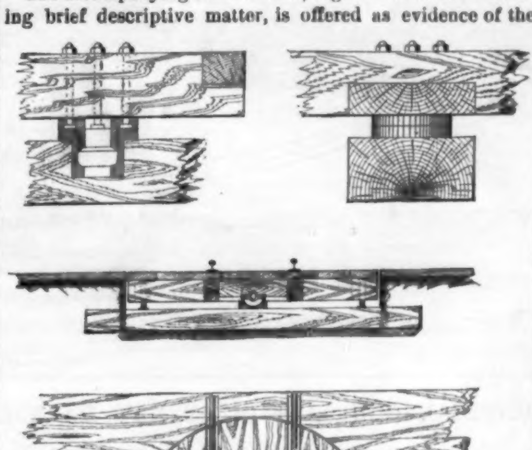
BUNDY PATENT RADIATOR.

contraction in any way to cause a leak, nor are they liable to injury from rust or freezing. They are made to fit almost any place, and no accumulation of water can occur in them, so that a positive, free circulation of steam is always assured. This radiator has no packing, and its construction is exceedingly simple, but each one, we are informed, is tested up to 125 pounds to the square inch before being sent from the factory. These radiators are made by the A. A. Griffing Iron Company, of 750 Communipaw Avenue, Jersey City, N. J.

A HOME-MADE TURNTABLE.

The facility with which a resort is made to "expedients," or the faculty that adapts whatever materials may be at hand in application to immediate requirements, is probably as important an element of success in engineering practice as "expectancy" is in exhibitions of spiritualistic wonders.

The accompanying illustrations, together with the following brief descriptive matter, is offered as evidence of the



A HOME-MADE TURNTABLE.

above, and showing what may be done by a disposition to exercise this faculty.

A small turntable, similar to those in use by contractors when portable track is in operation, was required at the bottom of an open shaft and adjacent to an elevator or hoisting cage.

As it was likely to be in use for a comparatively long time, it was desirable that it should be durable and have a pivot of so substantial character as to maintain the alignment with the rails of two lines of track, and those on the platform of elevator permanently.

Now the usual fittings even for a turntable of this kind, to say nothing of the more elaborate mechanism of a full-fledged locomotive turntable, have been the subject of much study and skill, but in this case there was made a very simple matter.

The table was made 6 feet in diameter, which was 2 feet longer than the wheel base of the cars used, and the materials consisted of:

2 pieces yellow pine, 6 inches x 12 inches x 2 feet 4 inches.
1 piece " " 6 " x 12 " x 8 "
4 pieces " " 4 " x 6 " x 6 "
8 " " " 2 " x 4 " x 2 "
4 cast iron wheels, 7 inches diameter.
5 bolts and nuts, ⅝ inch x 8 inches.
2 pivot castings, which were found in the scrap heap, being an old stuffing box.
30 feet B. M. 2 inch hemlock plank.

Total cost for labor and materials did not exceed five dollars.

The 8 foot length of timber, 6 x 12, was used in the foundation or support, and does not properly belong to the table.

The framing or manner in which it was put together is so simple and clearly shown in the illustration as to require no further description.

An International "Inventions" Exhibition in London.

A great exhibition on something of a novel plan, or one that is little respected in most of our modern fairs, is now projected, to be held at South Kensington, London, opening in May, 1885. The novelty of the plan is that it is proposed to limit the exhibition specifically to apparatus, appliances, processes, and products invented or brought into use since 1862. Untried and unpatented inventions will not be accepted unless recommended by a competent authority; and when the invention relates to parts only of a machine, the whole machine will not be admitted unless there be specially good reason therefor. Also, unless under exceptional circumstances, space will not be given for objects which have been shown in the Fisheries Exhibition of last year or the Health and Education of this year. Intending exhibitors must state in their applications the particular features of novelty in the articles they offer, applications from foreign countries and the British Colonies to be made by the 1st of November next. The exhibition takes place under government auspices, and our own and other governments have been invited to take official cognizance of it, our State Department suggesting that Congress will be invited to make an appropriation for securing a suitable American representation.

In this connection we would suggest, for the benefit of intending American exhibitors, that they cannot move too promptly in the matter of securing an English patent on any inventions they may think it worth while to send to this exhibition. The English patent law is very strict in requiring that applications for a patent there shall be made before the invention is publicly made known, and applications should be made even before the description of the invention is put in printed form in this country.

L'Abbe Moigno.

We regret having to record the death at St. Denis of Abbe Francois Napoleon Marie Moigno, in the 81st year of his age. He was borne in Brittany, at Guemenee—Morbihan—on the 20th of April, 1804. He was educated at Pontevy, and by the Jesuits of St. Anne d'Auray. He early manifested a strong predilection for science, and especially mathematics. This was not quite what the Jesuit order to which he belonged wanted, and as recently as 1861 he was directed to suspend the publication of a book on the calculus, and sooner than give way he left the order. His principal works are "Traite de la Telegraphie Electrique;" "Memoires sur le Stereoscope et le Saccharimetre;" "Repertoire d'Optique Moderne;" "Cours de Science Vulgarisee;" "Lecons de Mecanique Analytique;" "Les Eclairages Modernes;" many volumes of "Actualites Scientifiques;" and, lastly, "Les Splendeurs de la Foi."

The Abbe Moigno was, to use his own expression, one out of the *piocheurs* of his epoch. The word is untranslatable in his sense. It literally means one who handles a pick-ax. Rising every morning at 5 a. m., he performed his religious duties and then began work, which he did not cease to perform until evening, and he led this life until a very recent period. He was a man of vast erudition and a voluminous writer, having published more than 100 volumes on various scientific subjects, to say nothing of 21 volumes of *Cosmos* and 58 of *Les Mondes*. He was blessed with an astounding memory, and he was well acquainted with all the usual languages, ancient and modern. He invented a curious system of artificial memory, called "Mnemotechnie," by the aid of which he held at his disposal a vast number of facts, historical and scientific. It was wonderful to see with what ease he searched his memory for obscure dates or little known scientific facts. The Abbe Moigno's death will leave a blank which will not readily be filled, and he will be regretted by a large circle of literary men and friends.—*The Engineer*.

Full of Science.

The city of Philadelphia is at present overflowing with scientific men and scientific objects. The International Electrical Exhibition has just opened, the American Association for the Advancement of Science is in session, many prominent American scientists being present, together with a large number distinguished foreign visitors, members of the British Association. The American Institute of Mining Engineers is also in session; likewise the Society for the Promotion of Agriculture.

THE VICTORIAN GUNBOATS.

A very important addition to the colonial navy, and destined for the colony of Victoria, is, as we write, within the waters of Port Jackson, Australia, and a sketch is presented herewith of the vessels at anchor in Farm Cove. They are the gunboats Victoria and Albert and the torpedo boat Childers, which have lately arrived from England. They have come out from Portsmouth by way of Gibraltar, Malta, Suez Canal, Aden, Colombo, Batavia, Thursday Island, Cooktown, Townsville, and Brisbane. The officers and men of the "fleet" are all belonging to the Royal Navy; the Victoria is under the command of Captain A. B. Thomas, with Lieut. the Hon. M. P. Hutchinson, R. N., Lieut. Knox, R. N., Mr. J. L. Breaks chief engineer, and Mr. Ross second engineer, together with a crew of 34 seaman. The Albert is commanded by Lieut. R. Collins, R. N., with Lieut. Cuddy, R. N., Mr. Nicholson chief engineer, Mr. Lawrence second engineer, and 31 seamen. The torpedo boat Childers has a crew of 15 seamen commanded by Lieut. Jerrams, with Lieut. Williams, and Mr. Stewart engineer in charge.

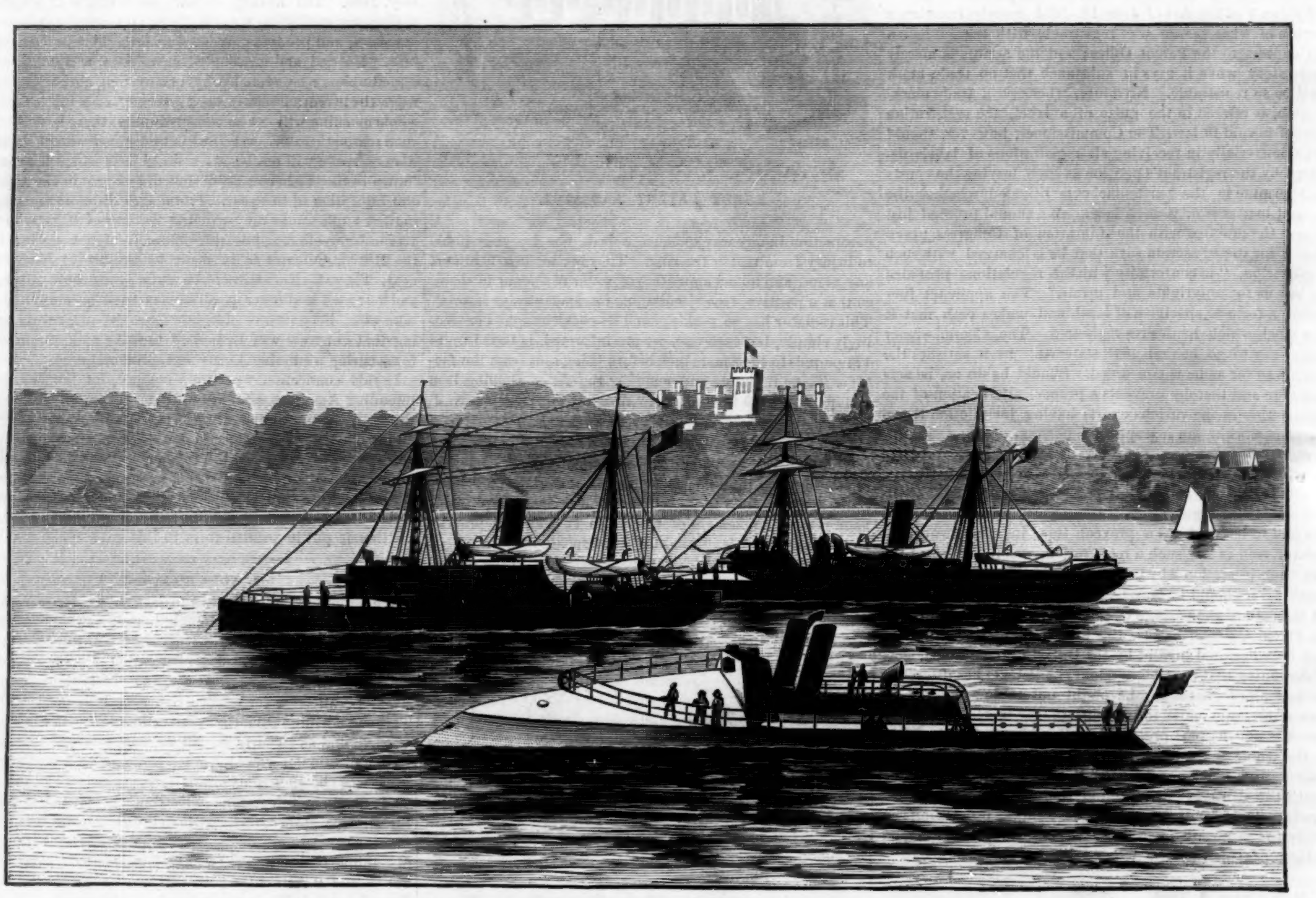
The Victoria is 145 feet long, 27 feet beam, and draws 11 feet, having a displacement of 530 tons. She is armed with one 25 ton gun of 10 inch caliber, two 12 pounders, and two Nordeufelt machine guns, and is supplied with more powerful engines than the Albert, and steams readily at a speed of 12 knots per hour; her engines being 800 horse power indicated.

The dimensions of the Albert are: Length 120 feet, beam 25 feet, and draws 9 feet 6 inches with a displacement of 350 tons. She is a 10 knot boat with engines of 400 horse power. She is powerfully armed, having at her stem one of Armstrong's 4½ ton breech loading guns, fitted with all the latest improvements. This gun, which is of 6½ inch caliber, can be worked by two men, and is protected by a steel shield 2 inches in thickness, and weighing 30 cwt. It is placed in such a position that it protects the men at the breech from being struck by small shot. Forward there is a 9 ton gun of 8 inch caliber, similarly protected by a shield, while she also carries two 9 pounders amidships.

The Childers, torpedo boat, is a sister vessel to the celebrated boat built by Messrs. Thornycroft and Co. for the Russian government. She is thus described in *Engineering*. Her dimensions are: Length on water line, 113 feet; beam (moulded), 12 feet 6 inches; depth, 6 feet 6 inches; draught forward, 2 feet 6 inches; aft, 6 feet; displacement, 60 tons. The hull is built of galvanized Bessemer steel, and is divided into 11 compartments by eight watertight bulkheads and two half bulkheads in the manner introduced by Mr. Donaldson. The boat will float with any of these compartments filled. Six powerful bilge ejectors are fitted. Two of these are placed in the boiler compartment, and are capable of ejecting 40 tons of water per hour each with a boiler pressure of 75 pounds. In addition to the ejectors, a bilge pump is worked off the main engines, and hand pumps are fitted for pumping the bilge from on deck. A separate steam donkey is provided, and the circulating pump, which is arranged with suction branches both in the boiler and engine rooms, as well as from the sea, is guaranteed to throw 45 tons of water per hour. The main engines are 14½ inches and 24¼ inches in diameter, by 15 inches stroke, and were guaranteed to develop 750 indicated horse power. They are of the now well known Thornycroft type of torpedo boat engines; they are fitted with a special valve, by which they can be converted into non-condensing engines if necessary. Auxiliary engines are used for driving the fan blower and for the circulating pump, in addition to which there is the steam donkey referred to; the former are placed in the engine compartment, and the donkey in the boiler room, but both fan and donkey can be regulated from either compartment. A striking feature is the steam steering gear, which is fitted in the forward part of the conning tower. The boat can be steered either by steam or hand in the conning tower, or by hand by means of the wheel further aft. In the forward compartment is a Brotherhood air compressing pump, the engine and pump being self-contained on one base plate. By this machine air is compressed to 1,500 pounds to the square inch for the purpose of charging the torpedoes and ejecting them from the impulse tubes. In the forward compartment is also the electric light machinery, consisting of a Brotherhood engine and an M. Gramme dynamo. A Mangin projector is used, by the aid of which objects are rendered visible at a distance of 1¼ to 1¾ miles. The boiler is of the usual Thornycroft torpedo boat type. The total heating surface is 1,119 square feet, of which 1,032 square feet is supplied by the tubes, and 87 square feet is contained in the firebox. The grate area is 30 square feet; the area of tube section is 4·74 square feet. It will be seen that in this small vessel of only about 60 tons displacement there are no less than seven separate steam engines, and the main engines alone are guaranteed to indicate 12½ horse power per ton of displacement on full power runs. The propeller is one of Thornycroft's patent; it has three blades, and is made of forged steel. The diameter is 5 feet 7 inches, and the pitch 5 feet 9 inches; the end of one blade is considerably out of the water when the vessel is at rest, but even at a very slow speed the boat settles sufficiently by the stern to immerse the screw, immediately on the engines being started ahead.

The gunboats are fitted with the necessary condensers, filter, tanks, boats, and gear, of the best description. All things considered, the vessels have had a fair weather voyage. The four or five days' bad weather experienced thoroughly tested their sea going qualities, and they behaved admirably, although necessarily from their size and construction they are rather "wet ships." Altogether they ought to prove a valuable acquisition to the defense force of the colonies in time of need, and, in combination with the gunboats ordered by the other colonies, should form a most effective fleet. The fleet remained in harbor for a refit, coaling, and painting, and, if they are favored with fair weather through the Straits, they will run into Hobson's Bay as trim and taut as any vessel afloat. Captain Thomas, R. N., with Lieut. Collins, Mr. Drewett, and Mr. Braker, remain in the service of the Victorian government, the other officers and seamen returning to the service in the old country.

The approximate cost of the gunboats as furnished by the Victorian government is, the Victoria, £40,000; Albert, £28,000; and the Childers torpedo boat, £120,000. This is the cost in England, and represents the amount for which the vessels are insured on leaving England. To this is, of course, to be added the cost of fittings for the voyage and bringing them out to Victoria, and at present this cannot be approximately estimated.—*Sydney Town and Country Journal.*



VICTORIAN GUNBOATS IN SYDNEY HARBOR.

Light, Heat, and Power Supplied by One Company.

The New York Steam Company is now laying pipe for furnishing steam along Fifth Avenue, together with another pipe intended for an electric cable. This company already furnishes steam for heating and for power for running elevators and many mechanical purposes through a large section in the lower part of the city, and steam so furnished is in many cases used to run dynamos for electric lighting. The new Mutual Life Building, with steam furnished by a six inch pipe, runs its elevators, heats the building, and operates the dynamos for 1,800 electric lights. The New York Steam Company is now preparing, however, to furnish the light direct from their own dynamos. By far the principal amount of steam used for other purposes is not required at night, and it is claimed, therefore, that electric light can be furnished at very low rates from the use of surplus steam. The president of the company, therefore, expresses the hope that within a year all the houses on Fifth Avenue below Central Park will be heated by steam and lighted by the dynamos of the company.

A Chinese-American.

The other day, says the *Journal of Education*, on the steps of our office we came upon a bright young Chinaman, whom we remembered as one of the wonderful boys selected by competitive examination and sent to America, where he graduated among the foremost in the high school of one of our large New England cities. Taken aback to see him completely transformed in dress, with cropped hair, we ventured the question, "How is this?" "Oh," said he, with a spurt of high spirits, "China was too slow after the Springfield high school. I went back, and found I was an American boy, and have come here to live as an American citizen." A system of education that changes a young Chinaman, certain of official promotion, to a bookseller's clerk in Boston, in four years, may be defective in various ways, but it certainly does the business for which it was made by the people—training boys and girls for active citizenship in the new republic.

PHASES OF KANGAROO LIFE.

The accompanying series of sketches serve to illustrate three particular phases of marsupial life, so to term them. In its wild state there is perhaps no animal more timid than the kangaroo, and in proportion to its natural timidity it possesses the acute sense of hearing. When grazing in mobs, they are constantly on the alert against surprise from their greatest natural enemies, the dingo and the Australian black, whose cunning in stalking them is marvelous. What means they possess of communicating approaching danger to one another is of course a mystery, but apparently the alarm usually is given by the warning animal striking the ground violently with its hind foot. The mob at once rear themselves up, and sniff for the source whence danger is supposed to be approaching. The "joeys," as the young ones are called, cling to the backs of their mothers, and, if very young, secrete themselves in the pouches, and, led by some "old man" warrior, a stampede takes place such as is portrayed by our artist.—*Illustrated Sydney News.*

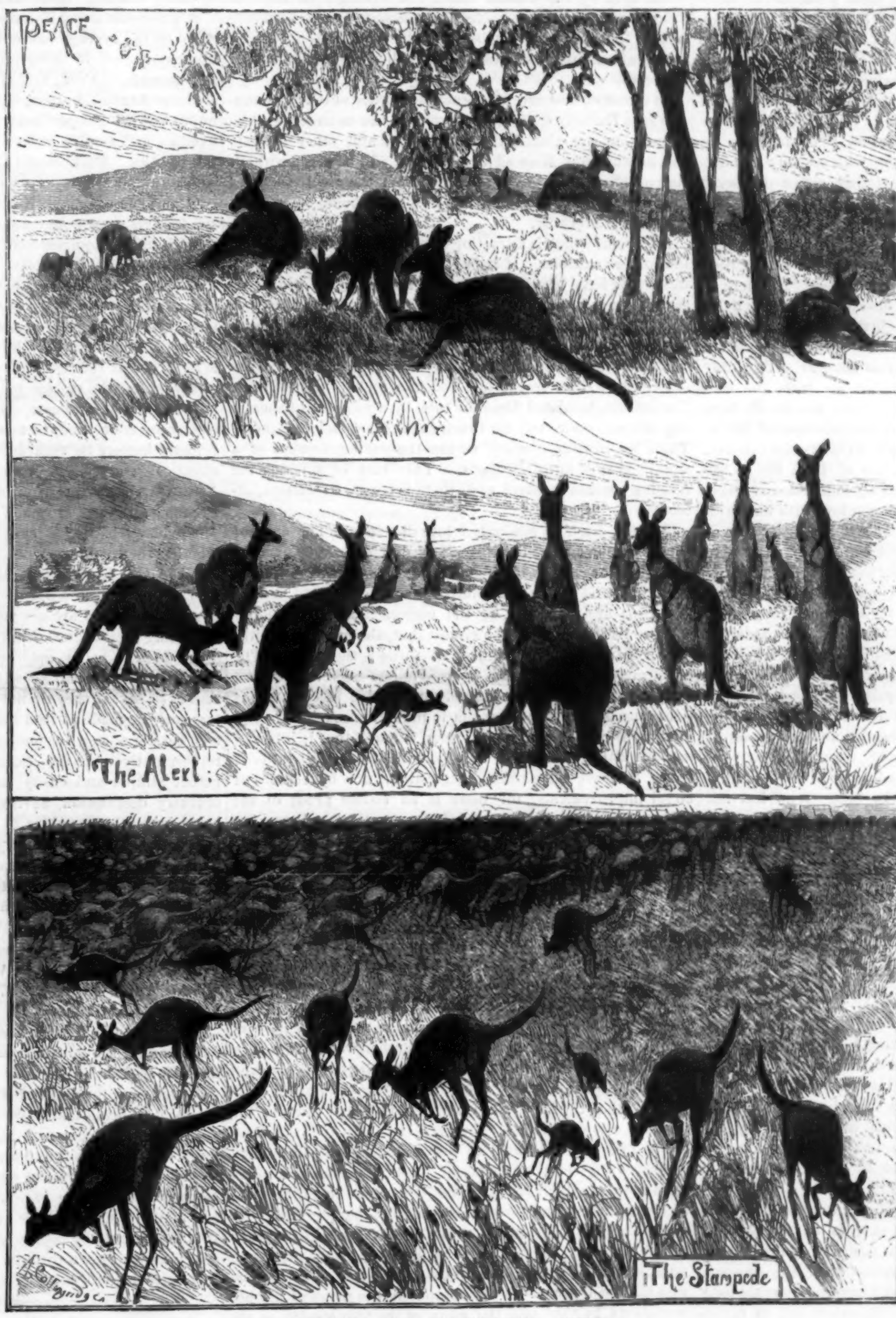
The Mad Stone.

A writer in the *Journal American Medical Association* acknowledges his indebtedness to Dr. Samuel Lewis, President of the College of Physicians of Philadelphia, for securing for him access to the collection of unpublished correspondence of Dr. Rush, which is preserved in the Ridgeway Branch of the Philadelphia (Penn.) Library, the following interesting account of the mad stone, and the early belief in its efficacy for removing poison:

In 1789 Dr. Percival suggested the application of fresh gastric juice, or the saliva of a healthy young person, obtained by chewing rennet, to the bite of a mad dog, after the wound had been thoroughly washed in the manner recommended by *Dr. Haygarth.* He also gave an interesting account, taken from Abbe Grosier's "Description of the Chinese," of a species of porous stone, used in "Tang-King," and called a "serpent stone." This stone was applied to the wounds of serpents and mad dogs, whereupon it adhered, drew to itself the virus, dropped off, and the patient was saved. This stone, after washing in lime water, could be used over and over again. This is the earliest allusion to the so-called "mad stone" which I have found.

The next reference to the "mad stone" which I have found is contained in an unpublished letter to Dr. Rush from a Mr. Samuel Davis, of Petersburg, Virginia, dated October 2, 1801. In this the writer endeavors to avert the hydrophobia from a son who had been bitten by a suspected dog. The boy, after some domestic applications, was, by the advice of a physician, cauterized and blistered almost to the bone of his arm. He was then almost wild, and was taken to a person reputed to have a "mad stone." With the performance of this stone the father was not satisfied, because, contrary to his expectation, and the popular belief about such stones, he could see no evidence of the poison boiling out of it after its removal. He therefore took his son to a second person owning a "mad stone." The application of this he graphically describes, and his seeing, after it had remained on for periods of twelve hours and was taken off and put into water, some bubbles arise from one corner of it, which the owner of the stone told him was the poison coming out. An investigation of the history of this stone revealed the fact that it had been given by a stranger who had been hospitably cared for when sick. It was wrapped in a piece of paper dated Charleston, South Carolina, 1740, and having printed on it the following:

"Francis Torres, a native of France, is in possession of a chymical preparation, called a Chinese snake stone, which will extract the poison of the bite of snakes, spiders, and of a mad dog, and will cure cancers, which are sold at half a guinea for the small and a guinea for the large ones."



PHASES OF KANGAROO LIFE.

Something about Elephants.

On the Queen's birthday and the day following it the khedda party in the Duars, conducted by Mr. J. Shillingford, were fortunate enough to succeed in catching seven wild elephants by the noosing process. This makes the total number now captured twenty-eight. On the former day the noosing party, mounted on their kunkies (fast tame elephants trained to the work), proceeded up the Joitee River, near Buxa, at gray dawn, and soon espied a herd feeding along the bank of that river. Approaching stealthily from different directions to within a short distance, by a sudden movement the kunkies were amid the unsuspecting quarry, and had secured four before the terrified herd rushed headlong and disappeared into the adjoining forest. Among the captives was a fine young tusker about five and a half feet high. They were all lashed between the tame ones and conveyed to camp, a long distance off, and there tethered for the night. Toward the small hours of the morning a great commotion where the elephants were encamped aroused every one, and a large female elephant could be just discerned moving about restlessly among the trees where the captured ones were tied. Being too dark at the time to attempt noosing, some of the kunkies were equipped with the rope gear and kept in readiness, silence was enforced, and the appearance of daylight anxiously watched.

The wild one very soon discovered the object of her search, when, with a cry of joy, she took up her position alongside the young tusker above referr ed to, and began caressing him all over with her trunk. The youngster made frantic efforts then to liberate himself, the mother encouraging all the while, and when panting he would fall to the ground exhausted, she would endeavor to assist him up. This excessive affection cost her her liberty. As soon as there was sufficient daylight for the purpose, within a few yards of her offspring she was noosed, as, on the approach of danger, she was reluctantly moving away. It was really wonderful how she managed to trace her young to the camp. The distance cannot be less than eight miles, while the track lay through dense forest, and the trail was mixed up with those of at least some fifteen other elephants, both tame and wild. She must have waited until it was dark, and then followed the track, reaching camp between 1 and 2 A.M. The sense of smell must be developed to a marvelous degree in elephants. On two occasions when mothers with calves have been captured and led away, their young have followed and been secured in camp, while another calf, a small suckling, is in camp with its mother, and is kept loose. If any one tries to approach, it runs up to the mother for protection, or else moves about among the captives without any fear or hesitation.

The usual style of feeding wild elephants, when first taken, is to lash them to the side of a tame one, and lead them out to graze. Some of the tame females here have taken a great fancy to calves intrusted to their care, and if by mistake a new one is brought up, she evinces her dislike to the change by kicking out at the unfortunate intruder. Elephants, it must be admitted, are curious animals, and the more you see of them the greater the interest generated regarding their habits. — *Bendigo and Tea Planters' Gazette.*

Electric Properties of Flames.

In Wiedemann's *Annalen,* Herr J. Collert describes the results of investigations on this subject, of which the following abstract appears in the Chemical Society's *Journal* for June: "This investigation is a continuation of Hankel's researches on the electrical properties of the Bunsen and alcohol flames. The method of experiment was as follows: A spiral of platinum was placed in the flame symmetrically with its axis, and connected with one pole of a Hankel electrometer, the other pole being in connection with the burner; the electrometer was also connected by a commutator with the poles of a zinc-copper pile conducting to earth. The principal results of the investigation are as follows:

"1. The difference of potential is dependent on the material and the temperature of the mouth of the burner; an electro-potential series of the materials of which the burners are constructed can be arranged, of which iron is the most negative. 2. The difference of potential is also conditioned by the position of the spiral; the point at which the greatest electromotive force is produced coincides probably with that of maximum temperature. This latter result probably represents the sum of several conflicting causes: first, by the rise of temperature the platinum is positively electrified; secondly, by contact with the hydrogen and carbonic oxide gas it is negatively electrified; and thirdly, in the cooler parts of the flame it is positively electrified by contact with steam and carbonic anhydride. As regards the second of these points, the experiments of Deville tend to show that the higher the temperature the greater proportion of free hydrogen and carbonic oxide present; while Grove has shown that platinum is negatively electrified when in contact with these gases. 3. The results obtained by the author agree with those of Elster and Geitl; the former finds for the E.M.F. of a platinum spiral in a Bunsen flame = 1·95 Daniells, in an alcohol flame = 1·43 Daniells; while the latter obtained the values 1·92 and 1·44 Daniells respectively.

A Barrel of Flour.

The cost of the barrel itself is 35 to 40 cents. It ordinarily requires from 30 to 40 pounds of coal to drive the machinery to make a barrel of flour. Four bushels and 40 pounds of wheat, or 275 pounds in all, are required to produce a barrel; or 196 pounds of good flour; bran and screenings, 69 pounds; loss not accounted for, 10 pounds.

Opening of the International Electrical Exposition, Philadelphia, Pa.

A little more than 130 years ago in Philadelphia, Dr. Franklin drew lightning from the clouds, and found it accompanied by the same phenomena as that often observed in his own laboratory. Near the same spot the International Electrical Exposition is now being held. It was opened last week with appropriate ceremonies, and by reason of its myriads of lamps, fed by electricity of the same nature as that which descended Franklin's kite-string, West Philadelphia wears a glow it never knew before. Electricity from a thousand lamps vies with the noonday sun, and night bids defiance to the day.

Though it cannot be said that its ample halls are replete with novelties, the Exposition possesses nevertheless so much of attractiveness as to well repay the intelligent visitor, let him come from centers the most scientific or lands the most remote. The committee of the Franklin Institute having the conduct of the enterprise, finding that novelties in large numbers, since they do not exist, were not to be had, wisely decided to exert themselves to the task of gathering together a complete collection of the best products of electrical science, pure and applied. How well they have succeeded may be judged from the fact that there are no really important electrical inventions, with possibly two notable exceptions, that may not be found either displayed upon the floors of their building or packed away in their store-rooms awaiting introduction. As in the case with most enterprises of this nature, the exhibitors have been dilatory, many of the most important exhibits having been "placed" only during the past few days. If there is wanted an excellent opportunity to observe the electric lighting systems on a large scale and in juxtaposition, it is to be had here. Their virtues as well as their defects are exposed to the public gaze, and any attempt to conceal a flaw only serves to attract the more attention. Aside from the economical status which, it is but fair to say, has hardly been decided as yet, the uncertain or varying duration of life of the incandescence lamp is readily seen to be its chief defect. Here and there a lamp for which a life of from 600 to 900 hours is claimed is seen to have suddenly dimmed, and others that have evidently served before are aglow with undiminished intensity.

Upon the opening day the committee of supervision were so much occupied with important details as to forget to set out cautionary notices regarding the approaches to the large dynamos and the big magnets, and they were surrounded by crowds, many of whom are no doubt by this time wondering what uncanny influence it is that makes their watches go too fast at one time and too slow at another.

The idea of giving no awards or prizes for excellence did not originate with the managers of this enterprise, but its adoption does credit to their discernment, and is a proof, if proof were wanting, that the element known vulgarly as "claptrap," forming so important a feature of most exhibitions, is to have absolutely no part in this. Who has not wondered, when looking over the advertisements in the public prints, that so many manufacturers got "first prizes" for the same article at the same exhibition? Indeed, the custom of giving everybody a prize has of late grown so common in some sections that the breach has come to be more highly honored than the observance. As an illustration of thus, it is recorded that at a recent English fair a man vending tobacco wandered through the halls exclaiming, "'Ere's yer prime smoking tobacco, h'only h'article in the h'exhibition what didn't get no prize!"

Official examinations will be made of everything of an important nature; the examiners being well known scientists with a special knowledge of the particular apparatus under inspection. Quantitative tests will, as far as possible, be made by methods which allow of a proper checking of results, and all codes or schemes for tests must be approved by the board of examiners. Moreover, all making applications for special tests must bind themselves to acquiesce, without appeal, in the results obtained.

This admirable plan, by which the deserving only will be rewarded, originated with the managers of the Vienna Electrical Exposition last fall. It is designed to prevent the adventurer and the quack from preying upon the unwary. The reports of the results of tests and examinations made by the several sections of the board of examiners will as far as possible include details of methods used and experiments made, and these reports will be signed by the majority of the members of the section. Hence, the promoters and projectors of any electrical apparatus examined will have in their possession an official paper stating in concise language, not what they claim for it, but just what it has shown its ability to do before a board of scientists who have no pecuniary interests in it whatever. Among the dynamo machines for lighting, plating, and miscellaneous purposes there may fairly be said to be nothing new, if we except an unusually large dynamo among the exhibits of an incandescence electric lighting company, and which is said to be capable of feeding 2,500 incandescence lights, each of 16 candle-power (equal to an ordinary gas jet).

Singularly enough, the electrical machines and apparatus required for the transmission of power from a distance are not among the exhibits, or rather are not to be seen; nor is there any project afoot, so far as a representative of the SCIENTIFIC AMERICAN could learn, to practically demonstrate the admirable system devised by M. Marcel Deprez, and carried out at Munich, in the shops of the *Chemin de Fer du Nord* in Paris, and still more recently at Grenoble. Yet this may, not unreasonably, be looked upon as by long odds the most important electrical problem of the day.

M. Deprez claims, and the French Academy, after examining his records, admit, that to a distance of ten miles he can transmit twenty horse power gathered from a running stream in the shape of electrical energy with the loss of not more than 60 per cent. He has recently averred that, with his improved apparatus, he can greatly reduce the loss of current while *in transitu*.

When the more discriminating of the general public have feasted their eyes upon the electrical fountain, which is good but not new, they show an inclination to go to the other extreme, and examine the small things. Among the most interesting of these is a recently improved motophone, or sound motor, invented by Mr. Edison. In this, a ratchet wheel is made to turn by the vibration of a telephone plate acted upon by the human voice. A tuning fork kept in vibration by electro-magnetism and mounted on a resonance box is the source of the sound, which operates a working model of a similar contrivance, said to be the invention of an Austrian.

In a remote and carefully guarded corner of the old Pennsylvania Railway station, given over to the managers of the Exposition, are placed the photometric and other delicate test instruments. Here all measurement will be made without fear of interference by induction from the great electrical machines in the main building; the latter being electrically connected, however.

A rheostat which is attracting some little attention is among the foreign exhibits. If it shall be found to fulfill the promises that have been made for it, it may fairly be said to deserve even more notice than it is now receiving. It has, it is said, been employed by M. Trouve in connection with his polyscopes to regulate the strength of current supplied by a small Plante accumulator. Like most rheostats, it consists of a German silver spring inclosed in a nickel plated tube. The spirals, insulated from the tube by a pasteboard sheathing, are not permitted to touch each other at any point. There is a rubbing contact within the spring, formed of a metal rod split into four parts. This idea of splitting the rubbing contact is novel and, there is reason to believe, effective.

The rod itself is graduated into divisions. The current enters at one end of the spring and, having passed over it, continues through the rubbing contact and the graduated rod. The rod being sunk deep into the spiral coil, only a few turns are traversed by the current, and very little resistance is indicated in the circuit, but, the rod being withdrawn, a considerable number of turns is the result. The exact number of turns may be ascertained from the vernier. Among the apparatus for high electro-motive force, such as lightning protectors, electrostatic induction machines, and induction coils and igniters, there is much that is interesting, but little that is new. The Voltaic-electric apparatus is likely to prove exceedingly interesting, not by reason of novel improvements, for there is no visible proof of the presence of these, but because of the practical and working exhibitions of Voltaic batteries and accessories and of polarization and storage batteries, that are to be given in the annex throughout the month. There are also to be seen working models of submarine cables—duplex, quadruplex, multiplex, and harmonic systems.

One of the most curious exhibits in all this large collection may fairly be said to be the instrument by which the personal error of an observer of scientific instruments may be established. All those who have had experience in the use of instruments of precision are aware that every observer has a "personal equation." In other words, few eyes are absolutely perfect, and hence no two observers, however careful, will see precisely alike. In the trigonometrical portion of the United States Coast and Geodetic Survey, for instance, the most skillful observers in the use of the theodolite find, upon comparing notes, that though they have measured the sides of a triangle under the same conditions of atmosphere, their results differ. Of course this difference is always very small, sometimes almost inappreciable. It comes from a difference between the "personal equation" of the observers; there is an error in the eye sight of one or both, amounting usually to tenths of seconds; and the custom has been, after each has computed the mean of his observations, to then take the mean of the two results as the final measurement. In the little instrument exhibited in the government display in Philadelphia, the personal equation may readily be ascertained in advance of observations, and hence each "sight" through a fine instrument may be corrected by adding or subtracting the error in the eyes of the observer.

The improved gas-engines work almost side by side with the steam-engines coupled up with the dynamo machines, and gas, even as an illuminant, refusing "to pale its ineffectual fires," presents itself through the powerful lenses of the new Siemens lamp. This may be regarded as an important feature of the exhibition, and give an opportunity for comparison which practical men will not be slow to avail themselves of.

As to whether gas as an illuminant is to give place to electricity is a question which has not yet been definitely decided; but that gas as a fuel is more economical and more easily handled than coal may be said to have been long since apparent. Expert tests with the gas-engines now on exhibition, intended by their projectors to usurp the place of the steam-engine in working dynamos, show that a greater intensity of light can be obtained through electricity from a dynamo worked by a gas-engine than could have been had, if the gas used as fuel had been turned directly into light. As is well known, by far the greater portion of the chemical energy of illuminating gas is turned into heat rather than light, whereas, in the case of the electric light, the converse is true; only a very small portion being turned into heat.

Quite recently Prof. Rowland, of the Johns Hopkins Institute, and Prof. Barker, of the University of Pennsylvania, both of whom are members of the committee having the conduct of the Exposition, computed the light that one horse-power yields in the Edison incandescence system, and found it to be in Carcel units (9 candles is equal to one Carcel) 11 to 21. Swan's incandescence lamp gives 16½. Recent measurements of the Voltaic arc light show that with distance of carbons 4 inches, and current generated by ordinary Gramme machine, a result of 585 units; distance of carbons, 1¼ inches; ordinary running Gramme machine, 230 units.

A gas-motor using illuminating gas has been found to consume on the average one cubic meter, or 37 cubic feet, per horse-power of 75 kilogrammeters, or, in other words, 542 foot-pounds. Prof. Von Marx, of Wurtemberg, has found that an Argand burner, on the other hand, consumes five cubic feet of gas per hour, gives a light equal to eighteen candles, and a cubic meter of gas will give a light equal to 120 candles. Reckoning a Carcel burner as being equivalent to nine candles, this corresponds to 13¼ carcels.

One of the principal, if not the most important exhibit of the foreign section has not yet been placed in the hall, though many inquiries have been made for it by electricians. This is a primary battery, the invention of an ingenious Frenchman. There is nothing new about the battery itself, and no claim for novelty of design is made for it. It is the elements that are used, or rather the combination of elements, for which a claim of novelty is made, and if the half of what is promised as the result of such a mixture may be strictly relied upon, the storage battery, so called, which has been held in such high esteem, must, so far as economy and efficiency are concerned, be relegated to second place, and the primary battery be regarded as the coming storehouse of electrical energy. A representative of the SCIENTIFIC AMERICAN succeeded after much trouble in finding the two French gentlemen, Messrs. Vignibouï and Breteche, who have this primary battery in charge. They are undecided as to whether they will carry out their original intention of placing it in the Exposition. It is difficult if not impossible, they say, to obtain a patent for a primary battery in this country, and they are not yet satisfied of the advisability of imparting their secret of the combination of elements until assured that a patent may be had.

If this primary battery will do what they promise for it, that is to say, if they do not deceive themselves, their battery may be made to feed incandescence lamps, each of sixteen candle power, for one cent the hour. As shown to the representative of the SCIENTIFIC AMERICAN, it is altogether simple and easily handled. The jars are of the ordinary description, having wires attached which may be led through the gas pipes of a dwelling or office. The design is to place such a battery in the cellar of a dwelling, for instance, and from it supply a complete incandescence lighting plant with electricity. To do this with the famous secondary battery, a steam engine and dynamo would be required, or else that the battery be taken out and recharged several times a week. It is claimed for this French primary battery that an ordinarily intelligent servant could recharge it, having only to pour in a new supply of liquids when exhausted.

It is easy to imagine, if the capability of this battery is not exaggerated, the innumerable other fields in which it might be made useful.

A section of the underground conduit for electric wires and mains, now being laid in certain parts of Philadelphia, viz., from Third to Fourteenth Streets and on Tenth from Chestnut to Market, has found a place in the main hall of the Exposition. It is composed wholly of iron, having many interior partitions for the various description of wires and electric mains. Manholes are arranged for street intersections. At these points, by means of a rope called a "pilot," new wires can be drawn through or old ones pulled out without any further disturbance of the road bed.

Painless Escharotics.

A painless caustic for the removal of warts and tumors may be made as follows:

Arsenious acid	1 part.
Sulphate of morphine	1 "
Calomel	8 parts.
Powdered gum arabic	48 "

This is to be sprinkled over the cuticle daily, the surface of which has been previously denuded by knife or blister.

Cauquoin's paste for the same purpose is composed of ten parts of chloride of zinc, two parts of alcohol (60°), and fifteen parts of wheat flour. The zinc in fine is added to the alcohol, then incorporated with the flour in a mortar, strongly pressing with the pestle. As soon as homogeneous it is spread with a roller into sheets an eighth of an inch thick, and after a few hours put into a well corked bottle.

Latour's nitrochloride of zinc paste is also an excellent preparation, and is made by dissolving fifty parts of the chlorida and one hundred parts of the nitrate of zinc in eighty parts of water. The solution is made by the aid of heat. When it cools, seventy-five parts of wheat flour is incorporated with one hundred parts of the solution, as with Cauquoin's paste.

ENGINEERING INVENTIONS.

A car gate has been patented by Mr. Chas. H. Hughes, of St. Louis, Mo. A series of bars form the gate, and combined therewith are tubes inserted in the car wall and adapted to receive the bars, each bar having a roller on its free end to run on the inner surface of the pipe.

A car coupling has been patented by Mr. Ferdinand P. Fisher, of Numidia, Pa. This invention covers a novel construction and combination of parts for an automatic coupler, providing means to receive and catch the common link, whether carried by a special or by the common draw head, and to guard the link against being broken.

An injector has been patented by Mr. Silas W. Moreland, of Geneva, O. This invention provides for utilizing an auxiliary steam jet to re-enforce and accelerate the effect of a primary jet, so as to render the injector more effective with any pressure of the steam and more reliable with variable pressures, besides affording a simple and cheap construction.

A steam boiler has been patented by Mr. Jose Rosello, of Havana, Cuba. Its outer shell is formed of a fixed section and a vertically removable section, with a casing surrounding the outer shell, and with an opening in which the shell can fit closely, so that it can be cleaned readily, and scale and other deposits removed from the tubes and the inner surface of the sides of the boiler.

A snow plow has been patented by Mr. George A. Gunther, of New Utrecht, N. Y. This invention covers an improvement on a former patent of the same inventor, and provides for a snow plow with a cannon or firing block, with a branching longitudinal bore, a wheel for receiving cartridges or torpedoes, gearing for revolving the wheel, and other novel features, for loosening and scattering the snow.

A slide valve has been patented by Mr. Riley Doty, of Leonardsburg, O. This invention is an improvement on a former patented invention of the same inventor, the live steam supply pipe to the back of the exhaust valve being connected with the live steam chest, so the water of condensation may escape back to the live steam chest and through the cylinder and exhaust with the steam, so the exhaust valve will work better than when the chest is flooded with water.

MECHANICAL INVENTIONS.

A device for automatically breaking doubled yarns in spinning mules and jacks has been patented by Mr. Celestin P. Maillard, of Fismes, France. This invention covers a novel construction by which all doubled threads, coming from broken ends being entangled with and twisted upon sound threads, are automatically broken at each drawing.

A nut lock has been patented by Mr. William H. Rothermel, of Blandon, Pa. Combined with a washer having ratchet teeth in its periphery and means for engaging a nut is a flat spring pawl with a rigid support, which projects out over the ratchet teeth to support the pawl in proper position, with other novel features.

A nut lock has been patented by Messrs. Philip Thomas, James E. Morris, John H. Chattin, and James T. Fisher, of Brighton, W. Va. The nut has notches in its rim along the inner edge, with a washer disk having notches in its rim along the outer edge, and a semicircular spring held on one end on the nut or disk, having at the opposite end a tooth or prong adapted to be passed into a notch in the disk, and a notch in the nut for locking the nut and disk together.

AGRICULTURAL INVENTIONS.

A grass seed harvester has been patented by Mr. Jacob I. C. Naff, of Winchester, Ky. The invention consists in comb teeth of peculiar form, peculiar elevating devices, and novel guides and bearing blocks for the axle, so the comb may guard itself from being choked by large weeds, and quickly raised or depressed to follow the height of the grass.

A combined cotton planter fertilizer distributer has been patented by Mr. Frank L. White, of Lebanon, Tenn. It is constructed with wheels and axle and a frame carrying the hoppers, with discharge wheels connected with each other and the axle by chains and chain wheels, the frame having also a furrow opening plow and covering plows for bedding the soil with the fertilizer, a furrow opening spring runner with covering teeth, and a roller for planting the seed.

MISCELLANEOUS INVENTIONS.

A miner's drilling machine has been patented by Mr. John W. Keeney, of Coalburg, W. Va. This invention covers a novel construction and combination of parts to make a light, strong, and inexpensive machine for drilling holes to receive explosive charges in mining operations.

A trap for catching rats and mice or moles has been patented by Mr. Andrew J. Conway, of Belleville, Ill. The invention covers a special construction and combination of parts for making a trap that is very sensitive, which will kill the mouse, rat, or mole, and which can be folded very compactly when not in use.

A clip for hitching straps has been patented by Mr. Peter S. Eastman, of Osage, Iowa. This invention covers a novel holder, consisting of a plate with apertures and loop, with a double wire, so that the strap shall not become loose by accident, and the device saves the trouble of tying as usually practiced.

A saw gummer has been patented by Mr. John Stoerapges, of Stevenson's Pier, Wis. The invention covers a combination, with a base block, of dies held therein, a plate held above the base block, means for pressing the plate on the base block and clamping the saw in place with gauges for holding the saw in proper position.

A mechanical telephone has been patented by Mr. John F. Sims, of Illiopolis, Ill. This invention covers a novel construction and combination of parts to facilitate the transmission of speech mechanically, and for properly adjusting the strain upon the transmitting wire, providing also a simple and effective means for giving a signal.

A cotton gin fire extinguisher has been patented by Mr. Thomas Renfroe, of Gainesville, Ga. This invention provides for a water distributing device held behind and between the brush and the saw, and connected with the water tank, so the water may be delivered on the revolving brush and saw, and thrown about in the lint room and on the gin.

A bird cage has been patented by Mr. William A. Coleman, of Rockville, Ind. There are side guides at the floor level, and a roll of paper extended over the floor of the cage and through the guides, so the soiled covering for the floor may be pulled out and torn off, and a new section from the roll unwound and made to take its place.

A combined lock and latch has been patented by Mr. Elijah Nyswonger, of Hanford, Cal. This invention covers an improvement on a former patented invention of the same inventor, whereby the construction of the lock is materially simplified, being operated without a spring, and capable of such adjustment that it cannot be opened from the outside.

A fifth wheel has been patented by Mr. Charles W. Allen, of Valentine, Neb. It is composed of a cup or semi-spherical socket adapted to be attached upon the upper side of the axle, and a hemispherical block or half ball fitting in the cup and adapted to be secured to the under side of the sand bar or forward spring of the vehicle.

A lamp bracket for musical instruments has been patented by Mr. James F. Conover, of New York city. This invention covers a bar held to slide into a piano casing at the end of the front, guided by suitable blocks, and having at its outer end a plate on which a lamp can be placed when the bar is withdrawn from the casing.

A plate holder for cameras has been patented by Mr. William H. Lewis, of New York city. This invention covers an improved catch for securing both shutters when closed, and also for holding the closed shutter when the other is withdrawn; also a fastening device for reliably holding the end covering or cap where the plates are inserted.

A sleigh has been patented by Mr. Charles A. Johnston, of Wall Lake, Iowa. This invention covers the making of the benches or beams and knees of sleds with T-bars placed side by side along the middle of the bench, with the heads of the bars upward and bent downward, and twisted in the knee portions, with other novel features.

A fence machine has been patented by Mr. Francis M. Comstock, of Keokuk, Iowa. The invention covers improved mechanism for corrugating wire and weaving it together with pickets of wood or iron, to make a cheap and substantial fence that may be put in rolls as delivered from the machine and transported to any desired place of use.

A chalice or communion cup for missionaries and traveling clergymen has been patented by Mr. Charles J. Curtis, of Washington, D. C. It is made in three separate parts, a bowl, a base, and an intermediate stem, so that it can be taken apart and the base and stem portion packed within the bowl, and thus be conveniently carried in the pocket.

A rowing apparatus or exercising machine has been patented by Mr. William Spelman, of Portland, Me. The apparatus provides for a continuous or endless track, with a boat or car on wheels and with oars, the act of rowing giving a forward movement to the boat or car, so the exercise will be more agreeable than the usual fixed machine.

A method of securing goods in the frames of embroidery machines has been patented by Mr. Benjamin F. Robinson, of New York city. This invention consists in plaiting the goods in the frame in such manner that nearly all the needles in the machine may be worked, notwithstanding the fact that the figures or patterns to be formed are a considerable distance apart.

A burglar alarm has been patented by Mr. Emil Baumbach, of New York city. It is made with a coiled spring inclosed in a case and carrying a swinging arm, levers, and pins for holding the arm while setting the alarm, a catch, and a nipple for holding a cap to be exploded, the contrivance promoting reliability and efficiency in the operation of burglar alarms.

A thill coupling has been patented by Mr. Edward H. Hollister, of Kenosha, Wis. The invention consists in a shackle of novel construction whereby increased convenience is afforded for shifting or exchanging the pole or shafts of the vehicle, which can be done without removing the eye piece from the clip of the shackle by simply unscrewing or taking off a nut.

A man trap for vaults has been patented by Mr. Samuel Cranston, of Philadelphia, Pa. It can be connected with a vault in such manner that when the vault door is opened the trap door drops and prevents the person that opened the vault door from escaping through the door at which he entered, and can be applied so as to entirely cover a vault or safe.

A silk and ribbon finishing machine has been patented by Honore Faisant, of Jersey City, N. J. This invention covers a special construction and arrangement of parts for watering and finishing silk with pressure rolls and steam heated rollers, with a corrugated roll for spreading the material laterally as it enters the machine, and other novel features.

A sash protector has been patented by Mr. Christopher C. Davis, of Flemingsburg, Ky. It consists of a metal strip to be attached on the upper face of the bottom rail of a sash, the strip having a ridge to be at the outer face of the glass, and with rests or stays for its inner face, and with drainage grooves, to allow any moisture which may collect on the inside of the glass to pass freely to the outside.

An apparatus for making composition flying targets and balls has been patented by Mr. Frank J. Moyer, of Lockport, N. Y. This invention covers a mould in two sections, the moulds being automatically filled with the molten mass, and after the balls have been cast, but before the entire contents are cooled, the mould is inverted and water sprinkled thereon, making the operation a very rapid one.

Business and Personal.

The Charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

Notes & Queries

HINTS TO CORRESPONDENTS.

Name and Address must accompany all letters, or no attention will be paid thereto. This is for our information, and not for publication.

References to former articles or answers should give date of paper and page or number of question.

Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all, either by letter or mail, each must take his turn.

Special Information requests on matters of personal rather than general interest, and requests for **Prompt Answers by Letter**, should be accompanied with remittance of $1 to $5, according to the subject, as we cannot be expected to perform such service without remuneration.

Scientific American Supplements referred to may be had at the office. Price 10 cents each.

Minerals sent for examination should be distinctly marked or labeled.

(1) W. C. S. writes: In your issue of 26th of July, in answer to question No. 2, you say "an inch pipe with an altitude of 25 feet (=10·85 pounds pressure) will deliver 5 gallons per minute, through a length of pipe=80 rods. Ellis' tables give 94 gallons per minute at 10 pounds pressure; this, of course is minus friction. Your estimate differs much from mine, and you will confer a favor if you will give me your formula for estimating friction. A. We use Haswell's Tabulated Numbers and Coefficients, $2356\sqrt{\frac{h}{l}\times d^5}=$ V in cubic feet per minute, being the tabular formula for the variations in diameter. The tabular number for 1 inch being 4·71, the formula $\frac{4{\cdot}71}{\sqrt{\frac{l}{h}}}$ = the discharge in cubic feet per minute; l = length, h = head or height. The computations for the various conditions of discharge are somewhat complicated. We recommend you to deduct from your pressure, as above given, the loss due to friction.

(2) R. T. sends us a specimen of a plant which he wishes us to name. A. It is Virginia snake root, or birth root (*Aristolochia Serpentaria*). The roots of this plant are well known in medicine and are kept in all drug stores.

(3) A. J. E. writes: The Water Works Company of this city propose to tap a creek one mile from the works with a pipe 14 or 16 inches at creek, decreasing to 8 inches at works, with a fall of ten feet in the mile. The water will be taken from a pond about four feet deep. This is all the force that it will have. What will be the discharge? It is to discharge into an open reservoir. A. The making of one-half or any part of the pipe line of different size is a mistake, as you will see by the following figures: A 16 inch pipe 2,800 feet long with half the fall, or 5 feet, will deliver about 2,300 gallons per minute. The 8 inch pipe for the balance of the line, or 2,500 feet, with a fall of 5 feet, will deliver only 285 gallons per minute. While a 12 inch pipe for the whole distance, say 5,000 feet, with 10 feet head, will deliver 795 gallons per minute. The cost of the 2,500 feet each of the 16 inch and 8 inch would be full as great as the cost of the 12 inch line through, and would deliver less than half the volume of water. A line of 16 inch pipe the whole distance will deliver 1,650 gallons per minute. A line of 8 inch pipe the whole distance will deliver 285 gallons per minute, or the same volume that the combined 16 inch and 8 inch pipes will deliver.

(4) H. P. C. asks: 1. I wish to make as nearly chemically pure sodium oleate as possible; what are the best and cheapest materials to use? A. Sodium oleate may be made by heating equal portions of soda and oleic acid with a small quantity of water; this forms a gelatinous mass, which can be purified by dissolving in alcohol. 2. Can commercial oleic acid be obtained pure? A. Purified oleic acid is sold in New York at 40 cents per pound, and a "C. P." oleic acid at $1.75 per ounce. The former is sufficiently pure for all practical purposes. 3. Is pure lard olein in the market? A. We do not know the article as you designate it, though fairly pure lard oil is plenty. 4. Is white caustic soda in sticks more than 98 per cent pure? A. It is not; the celebrated Greenbank alkali is of a guaranteed purity. 5. Is there a purer sodium oleate for sale in the market than Marseilles or Castile soap? A. The "Court de Payen" soap is considered the purest.

(5) J. C. H. desires directions for painting surfaces to imitate rosewood, the body color for the ground, and what colors are used in the grain and glazing or over graining. A. If you have the wood at present without paint, that is, the natural wood, the best plan will be to stain it with dragon's blood, carmine, English scarlet lake, and burnt sienna. A very bright shade is prepared by boiling well in water equal parts of logwood and red wood chips; this is applied to the wood while still hot, and from two to three coats are given according to the depth of color desired. You should stain your wood in streaks to imitate the natural wood, using, if you prefer, the materials first mentioned in varying proportions, always however with an excess of dragon's blood. Then varnish. If the wood is already painted and you desire to work over it, then it will be necessary to paint and grain with a mixture of English scarlet lake toned with burnt sienna (both ground in Japan) and finally varnished.

(6) E. M. & P. C. ask how a good scouring soap can be made; desire to make a tripoli soap, but would rather have it look white. A. Sand soap balls, which may be taken as a type of these sandsoaps, are prepared by adding to the melted soap about half its weight of fine silicious sand. For the finer qualities finely powdered pumice stone is now usually employed. The best yellow soap, with or without the addition of one-third its weight of white soft soap, and a little sweet oil are considered the most desirable ingredients to use for the manufacture of these soaps. A description of the machinery used in forming cakes is illustrated in SCIENTIFIC AMERICAN SUPPLEMENT, No. 258.

(7) E. E. P. asks: 1. What are the face and distance apart of the flint and crown lens of a dialytic telescope of 6 inches diameter? A. For a dialytic telescope of 6 inches aperture, make the focal length of the object glass 6 feet, corrector 2 feet, 3 feet apart. 2. How does this form compare with the common? A. It is not considered as good as the ordinary achromatic telescope. 3. How much nitro-muriatic acid will it require to dissolve half a pound metallic tin, and will the precipitate from this solution weigh half a pound? A. Nitro-muriate of tin: nitric acid 1 pound, hydrochloric acid 2 pounds, water 1 pound, tin ½ pound. The precipitate will weigh more than the tin used.

(8) H. D. M. writes: I have a valuable oil painting that has become soiled with fly specks, dust, etc. How can it be cleaned so as to look bright and new? Can it be washed with anything without injuring it? A. It is a little risky for an amateur to try such a job. The following is recommended, but any preparation may have to be modified for special cases: Put into 2 quarts of strong lye half a pound of Genoa soap, rasped very fine, with one pint spirits of wine; let them simmer on the fire for half an hour, then strain them through a cloth. Apply the preparation with a brush to the picture, wipe it off with a sponge, and apply it a second time, which will remove all dirt. Then, with a little nut oil warmed, rub the picture and let it dry. This will make it look as bright as when it came out of the artist's hands.

(9) R. L. B. writes: Some time since I saw a statement that the surface of the Pacific Ocean was higher than that of the Atlantic. Please state if this is the case, and ascribe a reason. A. The waters of the Pacific Ocean at the Isthmus of Darien are, in accordance with surveys, several feet higher than the ocean level on the Atlantic side. The revolution of the earth upon its axis is the primary cause of the motion in the waters of the ocean called currents. These currents have established themselves in certain directions, very much modified by the contour of the continental shores. They have been observed and mapped so as to exhibit upon the current charts of the ocean their direction and approximate force for every ocean and sea. Thus it is observed that there is a strong current upon the west coast of North and South America, setting toward the equator and abruptly turning to the westward in the latitude of the isthmus. The force required to arrest these two currents and turn them in a westward direction is supposed to be adequate to the elevation of the waters of the Gulf of Panama. The fact of the equatorial waters of the two great oceans running in currents to the westward indicates that their eastern shore levels are higher than the mean level of their whole surface.

(10) S. M. L. gives the following method of mixing turpentine and alcohol together in order to make a varnish for musical instruments. Place the turpentine in a large, wide mouthed glass jar, in a window fully exposed to the sun, for the space of six weeks or so (frequently shaking the contents so as to present fresh surfaces to the action of the air), when it will be found that the turpentine and alcohol (say 95 per cent) will readily mix.

(11) Dr. C. A. B. asks the details of making malleable cast iron, from the pig to the finished article. A. The iron for malleable iron castings is "white iron," made from Lake Superior ore, reduced by charcoal. The castings are packed in forge scales and sal ammoniac or in wrought iron drillings and salammoniac and borax, the flux of sal ammmoniac or of borax being only about one-twentieth of the mass. The packing is in cast iron boxes, in which the articles are exposed to a red heat in an oven for from six to eight days and then allowed to cool gradually. This is the present general practice; but improvements in methods and reductions in time are under experiment which promise to make a very great change on the present practice.

(12) L. D. B. asks: What prevents taking the air from water by an air pump in the top of an air tight tank not quite full? A. Nothing. 2. Would this heat the water? A. No. 3. For ice making, why is this not easy and simple? A. It would be easy enough, but of no practical value under present methods of making ice. 5. When air is out of water, does the water rapidly absorb it again if perfectly still? A. Water absorbs air very slowly when perfectly still. 5. About what would be the saving of fuel by using the exhaust steam to heat water for the boiler? Will you refer me to any information on the subject of extracting air from water for ice making? A. Heating the feed water of the boiler by the exhaust steam is of great economy where fuel costs money. Water in good heaters is raised to nearly 212°. Cold feed water is considered injurious to boilers, and often causes them to leak. There has been nothing published in regard to extracting air from water for ice making.

(13) C. W. B. asks how many square inches there are in a three inch valve, and how to get the square of any valve or cylinder. A. Area 7·0686 inches. Get the area by squaring the diameter, and multiply this sum by 0·7854.

(14) B. S. says: I have a bunch of little wire chains covered with rust; could you please inform me how to clean these chains? A. Dip in muriatic acid 1 part and 4 parts water, for few minutes, then wash in soda and tumble or shake in a box with charcoal dust; afterward brush with rouge.

(15) J. C. H.—The name "Holesteric" is given by a Paris maker of the aneroid to denote his own special make, which is said to have the best construction of the lever movement.

(16) C. P. W. asks the best way to remove tattooing (done with Indian ink) from the skin. I have tried pricking chalk in over it, but without success. A. Tattoo over the marks with milk, but it requires a good many separate trials, and is then only partially successful.

(17) F. A. R. asks: Can a man be said to move two ways at the same time? That is, if a man is on a moving train, and he walks from the front to the rear, can he be going or moving both ways at the same time? A. He cannot be moving two ways in relation to a single or specified object. He is moving one way in regard to the earth and another way in regard to the train.

(18) R. B. asks: Is a drum a musical instrument in a literal sense? A. It is, though undoubtedly often used to produce the opposite of "an agreeable combination and arrangement of sounds."

(19) W. W. asks: What will remove the stain caused by the yolk of fresh egg on woolen clothing? A. Use a solution of ammonium hydroxide and water; or an aqueous solution of any of the alkalies will dissolve the egg out of the cloth.

(20) A. D. G. asks the kind of soap most used in New York, and how to make it. A. Laundry soap is the most used. It is the ordinary hard soap produced by the combination of the alkalies, generally soda, with fat. There are perhaps one hundred varieties made in New York city, of various degrees of purity, certain of them containing rosin and others sodium sulphate and so on. It is impossible to give any definite information in regard to any special make, as this is generally kept secret by the manufacturers.

(21) J. R. C. asks: Is there any difference in the action of electric current in oxidizing storage batteries, when carried direct into one cell, or having a number of cells connected in series + to — and wires from dynamo to terminals? Which can be used with best effect, an intense current or a quantity current, in forming a storage battery? A. Sprague in his new work on electricity says that: "In charging a number of cells it is necessary so to arrange them in series and in arc as to distribute them on the same principles as ordinary battery cells when a number are used together. So many must be ranged in series that the number multiplied by the electromotive force is so much below the charging electromotive force as allows the required rate of current to pass. So many must be ranged in multiple arc as brings the united resistance to such a ratio to the available electromotive force as will permit the intended rate of current to pass, such rate being well below the proper working density suited to the area of the plates. It is important that all cells worked together should be fairly equal."

(22) L. F. C. asks about the method of cold storing eggs. A. There is nothing special in the cold storage of eggs more than to keep them as near 32° of temperature as possible in a dry cold room, which means that the ice should not be in contact with the air of the room, but kept in a separate metallic chamber over the storage room, unless other means of refrigeration are resorted to.

(23) R. G. says: I have a lead lined drinking tank 4x6x6 which leaks; have tried everything possible to stop it, but the hole cannot be found. What varnish or paint not injurious could be put on, in order to fill up the holes? A. Clean the tank out thoroughly and dry it. Paint the inside with Prince's metallic paint (red oxide of iron) and boiled linseed oil, and let it get fully dry before using.

(24) T. H. D. says: I have a large fan 18 feet diameter made of wood and iron, which is heavier on one side than the other. How can I know where to place a weight making it run at 90 revolutions nice and smooth? I can find a "standing" balance, but is that necessarily a "running" balance? A. A standing balance is all that is necessary for above speed. In SCIENTIFIC AMERICAN SUPPLEMENT, No. 368, you will find an illustrated article on the balancing of wheels.

(25) W. W. H. writes: Noticing in a recent paper the announcement that there was soon to be a trial made by the Swedish government of various spark arresters, I should like to ask what are the principal defects to be found in the leading makes of spark arresters to-day? Have been following up the subject myself, and would like to know what to avoid. A. In following up the subject of spark arresters, the principal thing is to avoid a half hundred spark arrester patents, most of which are owned by the builders of locomotives. We cannot go into the merits of the leading spark arresters without personal inquiry, which is somewhat expensive. You should first obtain copies of all the late patents.

(26) M. B. W. asks: Can I convey water one thousand feet by the use of iron pipe for siphon successfully? How would rubber pipe answer for the same, and the comparative value? Would burying the pipe under the earth have any effect as regards the atmospheric pressure? What amount of water would an inch pipe deposit in twenty-four hours as a siphon? I wish to carry water from a lake one thousand feet to grounds for gardening; do you think it practicable, and will it be lasting? A. It is perfectly practicable to convey water 1,000 feet in pipe of iron or lead underground. Rubber is too expensive. Burying the pipe would make no difference. As you give no information as to the height of the supply above the delivery, or the height of siphonage; we cannot give the quantity.

(27) P. S. M. asks: 1. With a hydrostatic head of 150 feet, what size inlet pipe would be needed to give one horse power with a good motor? A. About one-eighth of a square inch for 1 horse power. 2. What size would give 2 horse power? A. About one-fourth of a square inch for 2 horse power. 3. What would be best motor to use? A. Backus. 4. How much water would be consumed per horse power per hour? A. About 4 cubic feet per minute per horse power.

(28) J. W. & Bro.—The great drawback to the successful production of flax in the United States is no doubt owing to the cost of farm labor. The competition of jute for the coarser fabrics and fillings has also done harm in the flax industry. The use of ramie in England seems also to be the cause of checking the flax industry of Ireland, as returns of the acreage show a falling off of 40 per cent in the last four years. It is also probable that the dryness of our climate may have something to do with the difficulties of natural bleaching, which has heretofore given to the Irish products a great advantage.

(29) M. G. asks: Is it very hard to obtain a position after graduating from any of the best civil engineering schools in the East? If a position is obtained, what salary is given? Is civil engineering a good trade to learn, or is it one that is overcrowded? A. Graduates of the Rensselaer Polytechnic Institute, our leading civil engineering school, never have any difficulty in obtaining their first engagements; the same is also true of those coming from other prominent engineering schools. The salary at first is not likely to be high, but there is no trade where good brains with a good equipment of knowledge will more quickly bring handsome remuneration.

(30) O. H. asks by what process oil can be made to dry without evaporation, so as to form a glossy cover to the article it is applied to. Varnishes are useless for the purpose. A. The drying is a process of oxidation as well as evaporation. Litharge or oxide of lead favors the process. Boiled linseed oil will dry without mixture by heat. Oils have no body to form glossy surfaces. It requires gums or resins. See SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 241, 223.

(31) H. K. asks: The best paint for the inside of an iron kitchen sink, something that will prevent the sink from rusting. Ordinary paint washes from the iron, allowing the water to come in contact, causing rust spots. A. A kitchen sink of cast iron in daily use requires no paint. Keep it clean, and the grease in the dish water will keep it from rusting. There is no paint that will stick.

(32) F. V. H. asks address of firms who make a large power spring, something suitable to run a light boat. A. There have been several large springs (coiled) made for driving cars. They are used to a limited extent for driving sewing machines. The whole scheme of spring power is so far a failure. It costs more in labor to wind up the spring than is given out in power, by a large percentage. See SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 46, 47, 48, 50, for articles on spring motors.

(33) E. D. D. asks: What will remove lime deposits from a steam boiler? The market is full of remedies, and many (those that I have tried) are worthless or nearly so. How long will it take lime scale a quarter of an inch thick to ruin a boiler? It has been kept off directly over the fire. A. See SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 137 and 286, for articles treating of boiler incrustation. By feeding one ounce caustic soda per horse power to your boiler after having blown off thoroughly, letting it remain in the boiler for a day, then blow down two or three cocks every day for a week, and repeating for three or four weeks, you will reduce the scale so as not to trouble you. Afterward repeat the operation once a month after cleaning out.

(34) J. W. B. writes: When a railroad train passes around a curve at the rate of a mile a minute, which rail will sustain the greatest pressure, weight, and wear—the low or high rail? A. The outside rail, whether it be low or high. The centrifugal force throws the greatest strain upon the outer rail.

(35) A. C. H. asks: Referring to gelatine sensitive plates, what is meant by stripping gelatine? A. In photo ink printing processes, it is necessary that the negative film be reversed. This is done by removing the film from the glass support after it is dry, and is called "stripping the film." Before the emulsion is flowed upon the glass plate it is rubbed with French chalk, which prevents the film from adhering to the glass. After the sensitive film is dry, the edges of the plate are coated with a rubber preparation. To strip the film it is cut around with a knife just inside the adherent rubber border, and then easily lifted from the glass. 2. What is the working of the F. Gutekunst photo ink printing process? A. His particular method is kept secret, but the principle upon which it works is the action of light upon a bichromated potash gelatine film, as in all so-called photo engraving processes. A sheet of glass is coated with gelatine containing bichromate of potash; when dry it is exposed behind a negative to sunlight or the electric light. It is then immersed in warm water; where the light did not act the gelatine will dissolve out, leaving those portions acted upon by the light insoluble and in relief, when dry duplicates can be made from the relief plates by electrotyping for printing purposes. Mr. G., however, prints direct from the plate in a hand press, inking the plate over after each impression.

(36) E. M.—The mean rate of descent of the Mississippi at low water varies from 0·005 of a foot per mile at the head of the passes to 0·578 of a foot per mile at Cairo. During high water the rate of descent is higher at the passes, amounting to 0·115 of a foot per mile, while at Cairo it is only 0·497 of a foot per mile. From the head of navigation below the falls of St. Anthony to Cairo the rate is somewhat greater than at Cairo under the same conditions. At Rock Island the rapids add 24 feet to the whole amount. Distances by river: New Orleans to Port Hudson, 150 miles; New Orleans to Vicksburg, 400 miles; New Orleans to Cairo, 1,040 miles; New Orleans to St. Louis, 1,220 miles.

(37) H. D. W. asks: Can iron be cast or moulded inside of glass successfully? Will the strength of the glass be injured by so doing? Can iron be moulded into glass with portions of the iron projecting, and will the iron stand a pulling strain? Can copper or other metal be moulded inside of glass in the same manner? I have reference to moulding the iron in the solid glass. Would the contraction and expansion between the two materials break the glass? If so, how can it be avoided? A. We think not. Small objects of metal may be inclosed in glass, but the difference of expansion between glass and the metals would prevent doing this in a large way, as the glass would be likely to break. We know of no way of avoiding this.

(38) Somerville.—1. The insect which in this country has received the misleading name of "buffalo moth" is the larva of a small beetle, *Anthrenus scrophulariæ*, of the family Dermestidæ. It was introduced not many years since from Europe, and is now slowly spreading in the more northern portion of the United States. There are several other species of the genus Anthrenus occurring in this country, some of which are greatly feared as museum pests, but none has thus far been particularly destructive to woolen stuff. 2. The parent beetle usually deposits the eggs early in summer, and the larvæ which hatch soon afterward, attain maturity the next spring, the perfect beetle appearing during the months of May and June. There is, however, no regularity in the development of the species, and the insect may remain in the larval state much longer than one year, or under favorable conditions undergo two generations in the course of a single year. 3. Liberal and repeated application of insect powder or benzine will destroy the larvæ, while the use of tarred or tallowed paper underneath the borders of the carpet is to be recommended. Above all, the carpets should be more frequently taken up and cleaned, and the floor then washed with boiling hot water.

(39) P. & T. write: We wish to get some device for raising the water from the side of a canon on to a "mesa," or elevation about 100 feet above; can you suggest the best and cheapest method? A. If you have or can make a fall of 6 or 8 feet for the driving pipe of a ram, we would recommend a ram as the most reliable and cheapest appliance, having the advantage over a wind mill in running constantly.

(40) B. S. asks: 1. What size propeller wheel would be right for an engine 4 inches bore, 4½ inches stroke, on 80 pounds of steam? A. 24 inches propeller wheel. 2. Also size of boat? A. 30 feet boat. 3. Probable speed of boat of good model? A. 8 to 10 miles an hour. 4. A good composition of copper and tin for the link of above engine. A. Copper 1 pound, tin 3 ounces. 5. Probable number of persons above boat would accommodate. A. 15 to 30, according to width and draught.

(41) W. A. asks: 1. How can I soften the bulb to an ear syringe which has been in a case for years. It is very hard and will not give a bit, but cracks when pressed; it is white rubber. A. We do not know that vulcanized rubber that has become hard as you describe can be restored. 2. How shall I make a composition for copying letters at least 100 times? A. The hektograph composition is given in Notes and Queries, No. 27, May 20, 1882. 3. In SUPPLEMENT, No. 316, you give three recipes for making butter colorings, but the directions to use are for 1,000 pounds of butter; can you tell me how to find out what quantity to use for small batches, say 10 pounds to 25 pounds? A. For coloring 25 pounds butter divide the quantity by 40, and for 10 pounds by 100. 4. How shall I make a good lemon extract? A. The best lemon extract is to strain the juice, add 10 per cent alcohol, and bottle. Or, without alcohol, heat the strained juice to 160° in the bottles and seal tight. 5. How can I remove weather stains and discolorations from marble? A. Remove weather stains upon marble by washing with soap thoroughly, rinse down, and then wash with solution of oxalic acid in water with a swab and rinse clean.

(42) C. A. H. writes: Can you obtain for me the specifications of any patented lens grinding apparatus for grinding spectacle lenses? And can you inform me through your columns where I can have a machine or lathe for grinding spherical and cylindrical spectacle lenses manufactured, or the address of some one who makes them for sale or has made such a machine? Is there any work treating on grinding spectacle lenses, besides, the SUPPLEMENT? A. We know of no patents on lens grinding machinery. There are no machines on sale. The opticians have such crude machines as they use made by some machinist. There are no books on this subject. If you have SUPPLEMENT, Nos. 139, 142, 144, you will see about all there is in the machine. Those that make a business of grinding spectacle lenses have a large machine driven by power, with large laps, and cement the pieces of glass to a large lap in clusters of one or two dozen. This is the only way they can be done so cheaply. If you are not already an expert at lens grinding, you will have much to learn before you finish a perfect lens. Any machinist in your place can make all that is necessary for your work.

(43) G. J. says: I saw a short time ago a description of a combination of chemicals (I think) which upon being moistened generated a coal of fire. The article went on to say that it was utilized as a cigar lighter, etc. Can you tell me anything about the article, and where it can be obtained? A. You probably refer to the metal sodium. It will ignite when moistened. It is not at all adapted to cigar lighting, and should be very carefully handled. You can purchase it from almost any dealer in chemicals.

(44) E. H. D. says: Am anxious to learn the preparation and application of gum to fine glazed papers. I want to gum my paper similar to that upon postage stamps and labels. A. A mucilage made by boiling dextrine in water forms a good gum for labels. A very small quantity of molasses added will improve it, and prevent it from cracking. A good mucilage for labels is made from gum arabic with a little glycerine added, to render it adhesive to glass and similar substances; a few drops of carbolic acid should be added to preserve it. The following is said to be used on United States postage stamps: Gum dextrine, 2 oz.; acetic acid, 1 oz.; water, 5 oz.; alcohol, 1 oz.; the dextrine to be first completely dissolved.

(45) W. C. writes: I am making an induction coil according to the rules given in SCIENTIFIC AMERICAN SUPPLEMENT No 160. It says use naked copper wire for the secondary coil, but I have a large amount of covered wire like the sample inclosed. Would it not do to use that if I use enough? The SUPPLEMENT likewise directs the use of No. 16 cotton covered wire for the primary coil. Could I not use this here also? A. Covered copper wire is better than the naked wire, but the latter is cheapest. Your wire is rather coarse—No. 25—but you can make an effective coil by making it long in proportion to its diameter. It will not answer for the primary wire. Use No. 16.

(46) J. A. W. says: In making thin starch paste, I find that on standing it separates, giving off clear water. How can I prevent this? I prefer to use starch, but any paste that will keep well, and dry without gloss, would answer. It is used for a thickening substance, not for sticking. A. Your difficulty is that you do not boil your starch sufficiently. If this operation is conducted properly, the water should not separate.

(47) R. C. U. writes: I have a dark chestnut horse with light colored mane and tail. The hair of the mane is white at the ends, but next to the neck it is dark. It seems to grow out dark and fade as it becomes longer. Can you give me a recipe for a wash or preparation which would cause the dark hair to turn white without spoiling the gloss or making it come out? A. We would recommend you to use hydrogen peroxide, a description of which and method of using is given in SCIENTIFIC AMERICAN SUPPLEMENT, No. 339.

(48) W. R. J. asks how to put on lightning rods. Is not a quarter inch copper wire as good as any of the patent rods offered? What is a reliable rule for determining the number and height of the points? Is there any danger in making the ground connection with the usual half inch galvanized iron water service pipe? Is not this the best ground that can be made? A. A quarter inch copper wire will make a good lightning rod. Every salient point, such as chimneys, gables, etc., should be protected by the rod. Metal parts of the roof, gutters, leaders, etc., should be connected with the rod. The lower ends of your bell wires should also be connected with the rod or ground connections. If your house is large, a rod at each end or at each corner would be desirable. Water pipes make excellent grounds if the rod is well connected with them.

(49) A. T. McI.—The smaller glass tubes may be broken by nicking them one side with a sharp file, and then breaking them as you would a notched stick. The larger tubes you may shorten by means of an ordinary grindstone or by employing an iron lap charged with sharp sand and water.

(50) F. C. E. asks: In winding the secondary wire of coil described in SUPPLEMENT No. 160, the several convolutions of wire would frequently slip close to one another immediately after winding, thus making it impractical to wind the wire very closely. For this reason I had room for only one pound of wire. Could not the insulating paper be coated with something more or less sticky, so as to, in this way, prevent the wire from slipping? A. You might use an adhesive varnish for retaining the wires in place. A varnish of this kind could be made by dissolving beeswax in benzine or turpentine, and adding a very small quantity of oil or glycerine.

(51) J. W. E. asks (1) the name and price of the most complete treatise on springs, elliptic and spiral. A. We know of no work treating specially on springs. You will find the information you desire scattered through mechanical books and cyclopedias. You will find a good article on spiral springs in SUPPLEMENT No. 20. 2. Also the name of the scientific practical school in Hoboken, N. J. A. Stevens Institute of Technology.

(52) G. W. H.—A stove with a coil of pipe around the fire for heating bath tubs, or rather a small tank from which to draw the water into a tub, are in common use among those who have no range boilers. They are made to order. Any pipe fitter can make one. A blacksmith can bend the coil.

(53) J. M. R. writes: I am a young machinist; will you kindly inform me what steps I should take to become a marine engineer? A. Go as fireman on a small boat, and give strict attention to all the details of engine, after which you may advance to assistant engineer and so on up. There is also room in such field for all the study for which you can find time.

(54) S. W. R. asks: 1. Is it practicable, with two cells of gravity battery, to remove tin by electrolysis from old oyster cans, scraps of tin plate, etc.? A. No. 2. Is it profitable? A. No. 3. I want to run four electric lamps. Can I generate the electricity as cheaply as the oil costs? A. No.

(55) C. K. K. asks a recipe for making a good fire and water proof roof paint, of which coal tar is the basis. A. Coal tar has been used lately as a waterproof base for fireproof paint. It is no doubt cheaper than oil or other gummy substances, and probably just as good and safe. It is mixed in the same manner as oil, with any cheap mineral pigment or powder, such as asbestos, ground slate, or dry clay pulverized; to which add any dry color that you may desire for tinting. In order to make the best fireproof paint, it is desirable that as little coal tar be used as will just cement the mineral particles, so as to have the paint consist of as much mineral matter as possible. It will therefore be necessary to use turpentine to thin the tar, that you may be able to use a brush for spreading. The quantity of turpentine required depends upon the condition of the tar used, and will require a little practical judgment as a painter.

(56) F. C. S. asks how to take a cast in plaster of a bust, etc., and says he has heard of such being taken by the aid of photography by using, instead of paper to make the print upon, a sheet of gelatine treated with bichromate of potash. A. We know of no means by which you can make a mould of a plaster bust by the aid of photography. You can copy your bust by making a flexible mould in the following way: The materials are glue and molasses; 12 pounds of glue is steeped for several hours in as much water as will moisten it thoroughly; this is then boiled in a hot water bath; when the glue becomes fluid, 3 pounds of molasses is added and the whole is well mixed. The bust is placed in a cylindrical vessel somewhat deeper than itself. The inside of the vessel is oiled, a piece of stout paper is pasted on the bottom of the bust to exclude the mixture. If the bust is of plaster, it is weighted to prevent it from floating. Thoroughly oil the bust and pour over it the melted mixture of glue and molasses, covering the bust to a depth of an inch or so. Let the whole stand for twenty-four hours, after which remove it from the vessel, and by means of a sharp knife cut the mould from the bottom up the back of the bust to the front of the head. It is now opened and the bust removed; the mould is allowed to reclose, and a stout piece of paper or cloth is tied around it to keep it firm. The mould may now be thoroughly oiled, and a thin batter of plaster poured into it and shaken about until the entire inner surface of the mould is covered. The surplus of the plaster is poured out, and when that adhering to the wall of the mould has hardened, the mould may be removed from the cast in the same manner as from the original bust.

(57) B. I. B. writes: I have a small furnace holding a crucible that will contain 25 to 30 pounds, which I use for making brass castings. Now I wish to make a steel casting for experimental purposes, and wish to know whether the same or nearly the same heat that will melt copper will melt steel, and what I shall use to make a strong steel casting. Can get muck bar (puddled) iron such as is used to make boiler plate, and scraps from homogeneous steel boiler plate (ordinary steel boiler plate); which would be the best to use; and how shall I go about it? In short, how can I make crucible steel castings? Can you refer me to any works on the subject that will give the desired information? A. You can melt steel in your brass furnace by applying a blast to it. Steel melts at a considerably higher temperature than copper. You can use scrap steel and wrought and cast iron with manganese and a flux made of common bottle glass and charcoal. The process requires experience and judgment. A recent book on Steel and Iron, by William Henry Greenwood, gives very complete details.

(58) F. D. asks: 1. Which is the shortest and easiest process to obtain the skeleton of small and medium sized animals? Is there any acid or chemical preparation wherewith I can take off the meat without injuring the bones and without having a too great fetor? If so, please give me directions? A. You can remove the flesh from the bones of small animals by boiling. We know of no acid that would remove the flesh without being liable to destroy the bones. A method of removing flesh from the bones of small animals sometimes practiced is to place the animal near an ant hill, when the flesh will be removed by the ants. 2. Is annunciator cotton covered copper wire good enough for a dynamo five times larger, but like the one shown in SUPPLEMENT, No. 161? It is quoted 40 cents per pound. How many pounds of copper wire (about) are there on field magnets and armature of the dynamo in SUPPLEMENT, No. 161? A. Cotton covered copper will answer very well, provided the covering is not too thick. There about seven pounds of copper wire on the field magnets and armature of the dynamo referred to.

(59) D. McP. says: In a garden 100 feet long, 80 feet broad, a gravel walk of equal width is to be made down one side and across one end; what must the width of the walk be so as to take up just half the ground? A. Know of no better way arithmetically than by approximation. The walk will be 25·9680′ + wide.

(60) G. F. R. writes: I have a tank about 10 feet deep by 6 feet in diameter, full of water and open at the top; what amount of power would it require to force one cubic foot of air up through the bottom of this tank, and would it require any particular size pipe for the air to pass through? A. It will require 4½ pounds pressure per square inch to force air through an opening in the bottom of a tank. The size of pipe is indifferent, except that the larger the pipe the greater the quantity of air delivered in a given time.

(61) "Toronto" asks how sheet bluing is made, and the composition. A. The ordinary varieties of cake blue consist of indigo and starch. In answer to query 5 in the SCIENTIFIC AMERICAN of April 5, several other formulas are given, which may be used in combination with starch and glue to produce sheet bluing.

(62) J. H. writes: I wish to build a round cistern of brick 13 by 13 feet and 4 inches wall, with an arc one-third the diameter of cistern. Cistern to be located on the side of a main road. Will such a cistern built of good material be a good one? A. We do not recommend you to make less than an eight inch wall for so large a cistern. Lay the bricks in Portland cement well filled and backed. Finish with Portland cement plaster.

(63) G. I. V.—Type metal is simply lead and antimony. If you make the gate to your mould sufficiently deep, it will give the melted metal sufficient pressure to cause it to fill every part of the mould, and so is well adapted for casting many small articles—for images, vases, etc. Tin and antimony form a fine alloy for casting in plaster moulds. Zinc answers a good purpose, and will run sharp if the mould is well dried and vented.

(64) J. W. H. asks for the simplest way to erase rust spots from a white linen duck vest. A. Use warm oxalic acid solution or dilute hydrochloric acid, then tin turnings. 2. How varnish lampblack letters can be erased from Parian marble or alabaster? A. Make a paste with quicklime and water, cover the article well with it, and let it remain all day; wash off with soap and water, rubbing hard the stains; else use dilute hydrochloric acid, having previously removed all dirt and grease. Ground pumice stone may be used to polish the surface of alabaster or marble.

(65) E. L. C. writes: Being a student in the Rensselaer Polytechnic Institute, and finding in the work in drawing much use for an instrument for drawing dotted and broken lines, I have succeeded in modifying one of the ordinary roulettes so that it works very satisfactorily with printer's ink. India of course is much preferred by the professors in all and required in some departments. I am looking for some medium which will carry India ink so that it can be worked about as printer's, and thus combine the usefulness of the instrument with the excellence of India ink. Have experimented some, but have not made the work a success. A. We do not think that you will be able to make any preparation of India ink that can be used in the manner proposed. Such attempts have often been made. A judiciously selected printer's ink should answer very well, except for the most perfect work, for which India ink stands unrivaled.

(66) R. T. D. asks if there is a place in New York city to study mechanical engineering, excluding Cooper Institute. Would like to study it, but will not be admitted to Cooper Institute, being a business man. A. There is no such institution in this city or in this immediate vicinity. Unfortunately, neither Columbia College nor Stevens Institute will admit post-graduate students who have not taken the regular course. Even graduates from other colleges are not admitted for post-graduate studies. Partial courses which you could attend to at night are out of the question. Both these colleges are now so crowded with regular students as to make it impossible to accept others.

(67) J. D. H.—If the person to be lifted weighs 200 pounds, then each one of the four who do the lifting must lift his exact portion of that weight. Whether the lungs be full of air or not has no influence whatever upon the dead weight lifted. But it is a fact well known to every athlete that he can exert himself to better advantage and produce a greater effect by filling his lungs previously to putting forth his strength. The task he is to perform is no easier nor are his muscles any stronger, but by the mere action of holding his lungs distended his entire muscular system may be said to be in a state of severe tension, and when he does exert his strength it is with a concentration combined with a certain unconsciousness of abnormal strain which enables him to perform feats otherwise impossible. When this same degree of concentration is directed toward lifting a weight which he can handle easily under any condition, we can readily comprehend how he may be unconscious of any effort. You will find that four weak people, who cannot individually lift 50 pounds, cannot lift a person weighing 200 pounds under any circumstances—lungs inflated or not.

(68) H. W. S. asks if colored glass, that is, colored by metallic oxides, can be pulverized or ground, and on being subjected to a proper degree of heat again become transparent and regain its former color? A. Most of the colored glasses could be used in the manner described.

(69) G. A. T. asks for a receipt for a liquid starch polish, such as is used to give gloss to linen collars and cuffs. A. A little paraffine in the starch and a polished iron does the business. Or, procure 2 oz. of fine white gum arabic, and pound it to powder. Next put it into a pitcher, and pour on it a pint or more of boiling water, according to the degree of strength desired, and then having covered it let it set all night. In the morning pour it carefully from the dregs into a clean bottle, cork it, and keep it for use. A tablespoonful of gum water stirred into a pint of starch prepared in the usual manner will give a beautiful gloss to shirts, etc.

(70) J. H. W. writes: Please settle a dispute by telling us whether the Government makes anything by the coinage of nickel 5 cent pieces. Or in other words, is the nickel in a 5 cent piece worth five cents? If not, how much is it worth? Also, is the copper in a copper cent piece worth one cent? A. A copper cent weighs 48 grains, and contains 95 per cent copper and 5 per cent zinc. The 5 cent piece weighs 77·16 grains, and contains 75 per cent copper and 25 per cent nickel. Copper is worth about 13 to 14 cents per pound, and nickel about $3.00 per pound. From the foregoing you can calculate somewhere the exact value of the coins. The Government makes about three-tenths of a cent on the cent and perhaps 2 cents on the 5 cent piece. See [page 52 of SCIENTIFIC AMERICAN for July 26.

(71) T. H. would like to know the method of making what is known in England as the vesuvians, together with the ingredients. Also the best machine for cutting round splints for same, similar to matches? A. The heads of vesuvians are made up principally with powdered charcoal and saltpeter in some such proportions as those in the] following: 18 parts saltpeter, 19 charcoal, 7 powdered glass, 5 or 6 gum arabic or gedda; to these are added a little scent, in the form of satin wood, lignum vitæ dust, cascarilla bark, or gum benzoin, which renders them fragrant when burning. The igniting composition is identical with that for ordinary matches. See article on matches, SCIENTIFIC AMERICAN SUPPLEMENT, No. 84.

(72) A. W. A. writes: In front of my dwelling is a tree, the leaves of which fade and drop off every year about the 1st of August, and in two or three weeks it again has new and dense foliage. What is the cause of this? A. We could not assign a cause without knowing more of the facts as to the kind of tree, or whether the same kind of tree acts in the same manner in your neighborhood. If not, it is probably want of moisture at the dry season. Possibly the dryness of the soil may allow gas to percolate from the sewers or mains.

(73) E. J. K. asks: 1. Are there any papers so prepared as to be discolored from an electric spark? If so, can you give the process for making? A. We take the following from Prescott's "Electricity and Electric Telegraph:"

No. 1.

Nitrate of ammonia, about	4 lb.
Ferricyanide potassium, about	1 oz.
Gum tragacanth	4 oz.
Glycerine	4 oz.
Water	1 gal.

No. 2.

Nitrate ammonia	2 lb.
Muriate ammonia	2 lb.
Ferricyanide potassium	1 oz.
Water	1 gal.

No. 3.

Iodide potassium	½ lb.
Bromide potassium	2 lb.
Dextrine or starch	1 oz.
Water	1 gal.

Paper is saturated with either of these solutions. It never becomes entirely dry; the sensitiveness of paper treated with these solutions varies in the order of the above arrangement, No. 1 being the least sensitive and No. 3 the most sensitive. 2. Are there any in the market that can be bought in sheets? A. You can buy the prepared paper in strips, but not in sheets. 3. Is it very expensive? A. No. 4. Will ordinary light effect it? A. Not materially. 5. Is it dry? A. To be effective it must be slightly moist. 6. Does it have to be washed or dipped? A. No.

(74) A. C. asks: 1. What is gas carbon? Is it any different from carbon? Where can it be obtained? A. Gas carbon is the form of carbon deposited on the surface of gas retorts. It can be obtained at any of the gas works. 2. How can an electrical turntable be made, cheaply, by an amateur? A. Apply to the motor described in the article on an "Electric Cabinet," in SUPPLEMENT 191, a table, and you will have an electrical turntable. 3. Cannot the ordinary "Crowfoot battery" be used for experiments in place of the Grove or Bunsen battery? As near as I can understand, all that is required is a current of electricity, no matter what kind of a battery generates it. Is not this correct? If this idea is wrong, which is the cheapest battery—Grove's or Bunsen's? A. You are correct in regard to batteries, but the gravity battery yields a comparatively weak current, and you would require a large number of them to do the work that could be performed by a few Grove's or Bunsen's cells. 4. Which gives the strongest current? A. There is very little difference, but the bichromate form of Bunsen's battery is preferable. 5. What is a good book for one just beginning to study electricity? A. Ganot's "Physics" and "Electricity, its Theory, Sources, and Applications," by John T. Sprague.

(75) H. C. K. asks if there is any acid or similar liquid for etching on hard rubber or gutta-percha. Also the way of using. A. We know of no liquid that can be used for etching hard rubber or gutta-percha. These substances may, however, be etched by means of a sand blast, or they may be stamped or shaped by means of warm dies.

(76) L. H. N. asks for a cheap means by which to obtain a high polish on black walnut. A. Take equal parts of rather thick alcoholic shellac varnish and boiled linseed oil, mix them well together, and apply to the wood with a cotton cloth pad. Rub the wood briskly until a desired polish is secured. The mixture must be well shaken before using.

(77) A. J. W. writes: 1. Would the dynamo machine described in SCIENTIFIC AMERICAN SUPPLEMENT, No. 161, with one-half horse power, develop sufficient light with an Edison lamp to light a room 12 by 13? A. Yes, if driven with sufficient speed. 2. What would be the power of the light compared with an ordinary kerosene lamp? A. Quite equal to an ordinary kerosene lamp. 3. Have you ever published directions for making a photometer in the SUPPLEMENT? A. For photometers consult SUPPLEMENTS 283, 270, 204, 8, 237, 379, 284, 387, 250, 390, 230, 431. SUPPLEMENT 250 gives instructions which will enable you to make a simple photometer.

(78) J. W. writes: In the SCIENTIFIC AMERICAN SUPPLEMENT, No. 166, I saw in your description of the electric pen that you would have to use an induction coil; now what I want to know is, how large an induction coil should I use, and how much wire you have to use for the secondary coil. Would 1 oz. do? A. An induction coil that will yield a one-eighth inch spark would answer your purpose; you will probably require two or three ounces of fine wire for each coil. For information on induction coils consult SUPPLEMENT, 160.

(79) J. J. W. writes: 1. Can you inform me how to purify the ordinary sheet zinc so that it can be used for a zinc in a battery? A. Ordinary sheet zinc will answer very well for a battery, when melted and cast in a proper form. 2. Is there any way to color gold solution so as to make it plate darker? My solution is of pure gold. A. For information on electro metallurgy consult SUPPLEMENT 310.

(80) M. M. B. asks how to mould petroleum wax. Of what material should the moulds be made, and what will prevent the wax from sticking? A. If by petroleum wax you mean paraffine, plaster of Paris moulds will answer very well. Powdered soapstone or starch would probably prevent the paraffine from sticking to the mould.

MINERALS, ETC.—Specimens have been received from the following correspondents, and examined, with the results stated:

J. P. T.—The mineral you send is a clay iron ore, and may contain manganese. In order to determine the presence of manganese, a chemical analysis will be necessary, costing $5.00. Cane sugar has the composition $C_{12}H_{22}O_{11}$. The action of bone black is not chemical, but mechanical. It removes the color, and absorbs other soluble matters.—G. C. W.—The specimen is pyrite, or iron sulphide. Its value is dependent upon its carrying gold. In order to ascertain this circumstance, an assay costing $5.00 will be necessary.—W. O. C.—The specimen is hematite, or specular iron ore, and its value depends upon its purity, that is, its freedom from deleterious constituents such as sulphur and phosphorus. An analysis costing $15.00 will give you better information.

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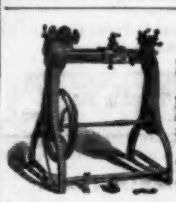

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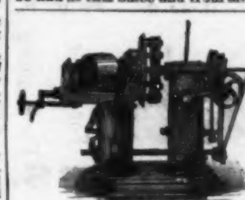

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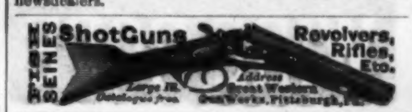

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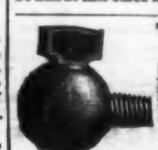

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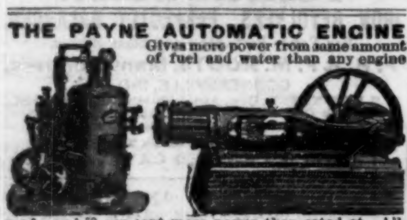

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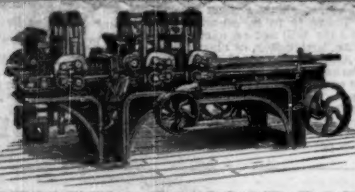

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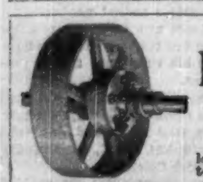

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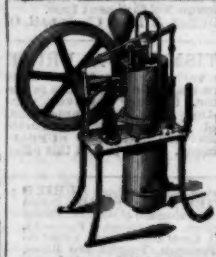

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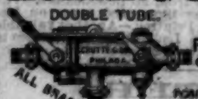

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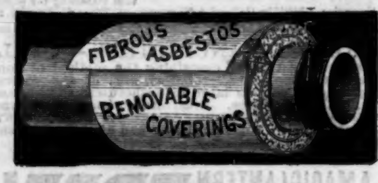

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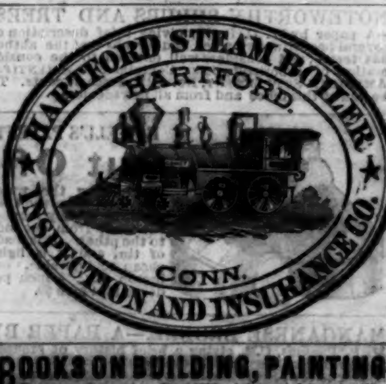

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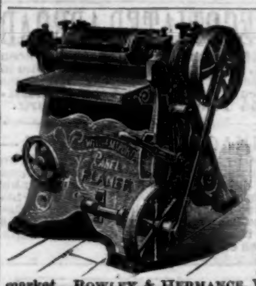

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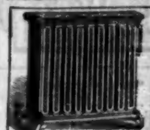

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